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NEW YORK

No. 1

Look You to the Hardy Norseman

While the United States Has Talked the Norwegians Have Been
Busy—So Once More We Ask, "Are We Really 'Up to Snuff'?"

IS THE American merchant marine really growing? This question is not as foolish as it sounds. We are all familiar with the customary newspaper story about the tremendous boom in shipping accompanied by unparalleled ship yard activities, and soothed by the externally graceful picture thus laid before our eyes, we have gone about our business complacently assured that the stars and stripes are rapidly regaining their lost prestige on the highways of commerce. But let's tilt the lid a little.

"Steel merchant vessels building or under contract in private American ship yards on Nov. 1, 1916," according to builders' returns to the bureau of navigation, department of commerce, "numbered 417 of 1,479,946 gross tons, an increase of 25,676 tons over returns for Oct. 1."

"Fine," says our complacent citizen. But wait—about half of this splendid fleet of ships is listed as "For Foreign Account", mostly Norwegian. In other words, instead of there being 1,500,000 tons of new American ships under contract, there are only about 750,000 tons; instead of over 400 ships, only about 200. The complacent citizen is beginning to sit up and take notice. Perhaps the explosion of a few more mines will jar him into sensibility.

The Ubiquitous Norwegian

Since the war started, a goodly fleet of American vessels have been sold to foreign owners, mostly to the ubiquitous Norwegians. In all of these cases old glory has been furled for keeps and stowed away in the flag locker, while a new strip of bunting floats at the masthead. This situation is summed up succinctly by an eminent authority in the following words, "Of late our flag has probably been losing tonnage, or at most barely coming out even." For in addition to sales, our merchant marine is depleted through the natural ravages of the elements and the unnatural reactions of the torpedo. Our losses from the latter cause, although slight, are not inconsiderable.

It is the same old story. We are not yet awake. While we have been talking about upbuilding our merchant marine our Scandinavian friends have been

out grabbing the tonnage right out of our own harbors and in our own ship yards. While we dwaddled and debated over whether the government should spend \$50,000,000 for a dinky fleet of 50 ships, the hardy Norsemen spent \$150,000,000 right here in our own market and apparently they are only about half through. Norway's merchant marine is a fact. Ours, comparatively speaking, is still a hope.

Now, why is this? The biggest reason—the one that sticks up like a sore thumb—lies in the fact that in Norway private enterprise is *encouraged* to go into the shipping business, while over here the government tries to hog the whole game and any private citizen who risks a dollar in the business is a grafter and an enemy of the republic. That, in brief, is the whole story.

Where Everybody is Interested

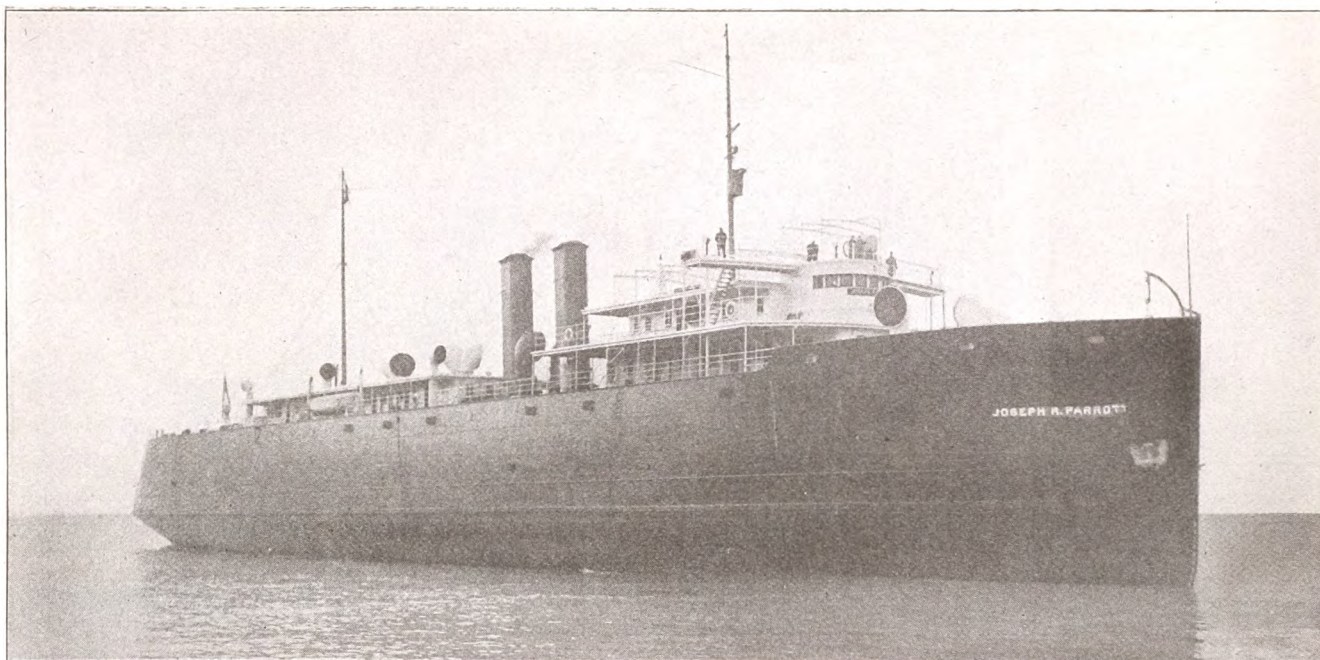
Contrast the two policies. In Norway nearly everybody has a direct interest in ships. It may be nothing more than an undivided one sixty-fourth in a floating coal scuttle or one share in the Hardanger Fjord Soforsikringsselskab, but the connection is vital and tangible. But in our own United States, as a result of constant government meddling, our people, as a whole, are ignorant of or indifferent to shipping ventures. And right here we put our finger on another vital weakness.

We will never have a strong merchant marine until investments in shipping securities become popular. Even if governmental restrictions were removed, the people and the banks would have to be educated. The average American banker classes shipping securities with Bolivian rubber shares—beyond the pale of financial respectability.

Fortunately there is a leaven of better sense along the Great Lakes and from this center we hope enlightenment may spread. Bankers in Cleveland, Detroit, Buffalo and other lake centers aren't frightened when asked to negotiate an issue of steamship bonds. As a result of conservative financing of local issues, shipping securities are held in high esteem along the lakes. May they soon be so everywhere.

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Car Ferry Parrott Leaving Cramp Yard on Maiden Voyage

New Car Ferry for Ocean Service

WHEN building the Florida East Coast railway, it was the dream of the late Henry M. Flagler to carry this road through to Key West and incorporate a direct freight service between the United States and Cuba. To do this, it would be necessary to transfer the loaded freight cars from Key West to Havana. As there is a strip of some 96 miles of ocean between the two points, the only possible way would be by means of a carferry line.

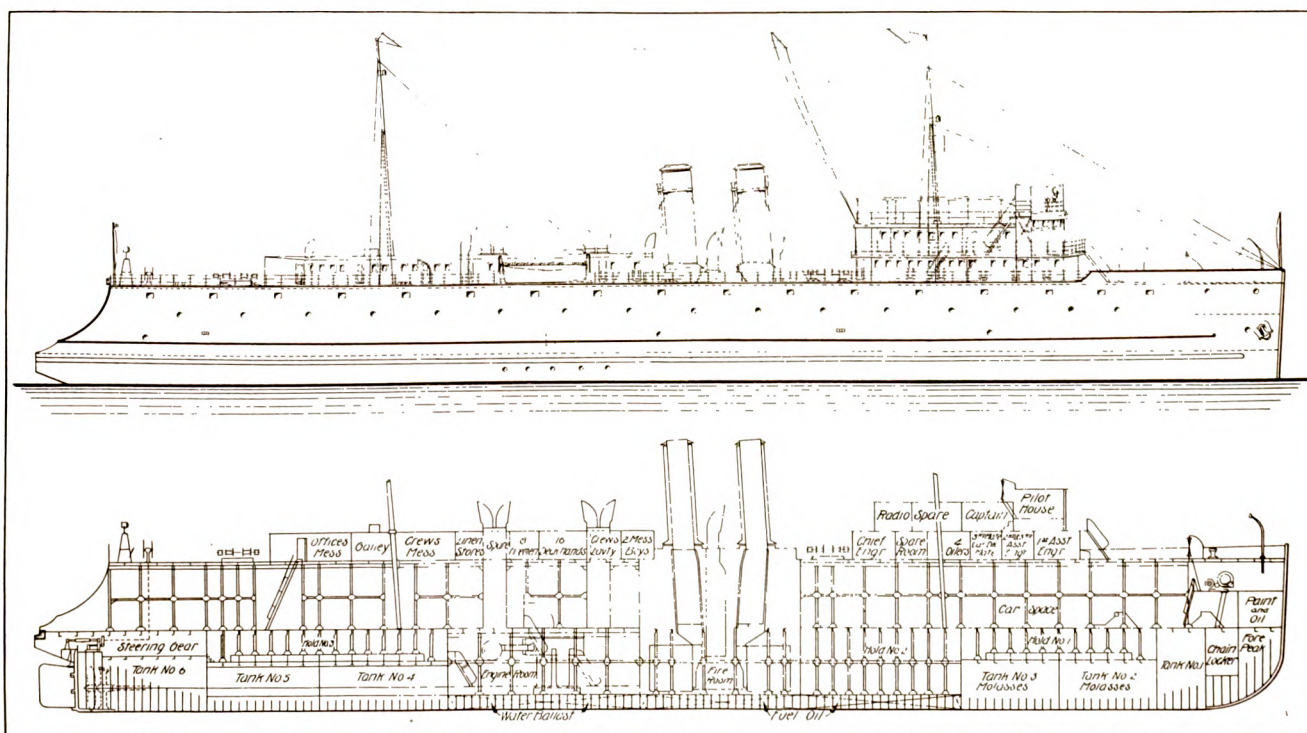
This dream became a realization when in 1914 the William Cramp & Sons Ship & Engine Building Co., Philadelphia, delivered the carferry HENRY M. FLAGLER, which has since proved most successful in this service. The second vessel, JOSEPH R. PARROTT, has recently been constructed by the Cramp company to augment the carferry service between Key West and Havana.

HENRY M. FLAGLER was described in *The Marine Review*, November, 1914,

and the new carferry is greatly similar. JOSEPH R. PARROTT has a capacity for 30 of the largest freight cars loaded, and will make the trip between Key West and Havana in eight hours. Her general dimensions are:

Length overall, feet.....	350
Length between perpendiculars, feet....	337
Beam, molded, feet.....	57
Depth, feet	22
Speed, loaded with 2,300 tons deadweight, knots	12

The hull is built of steel, conforming



PROFILE AND CROSS-SECTION OF CAR FERRY JOSEPH R. PARROTT

in every respect to the rules of the Bureau of Veritas for a vessel of this special class.

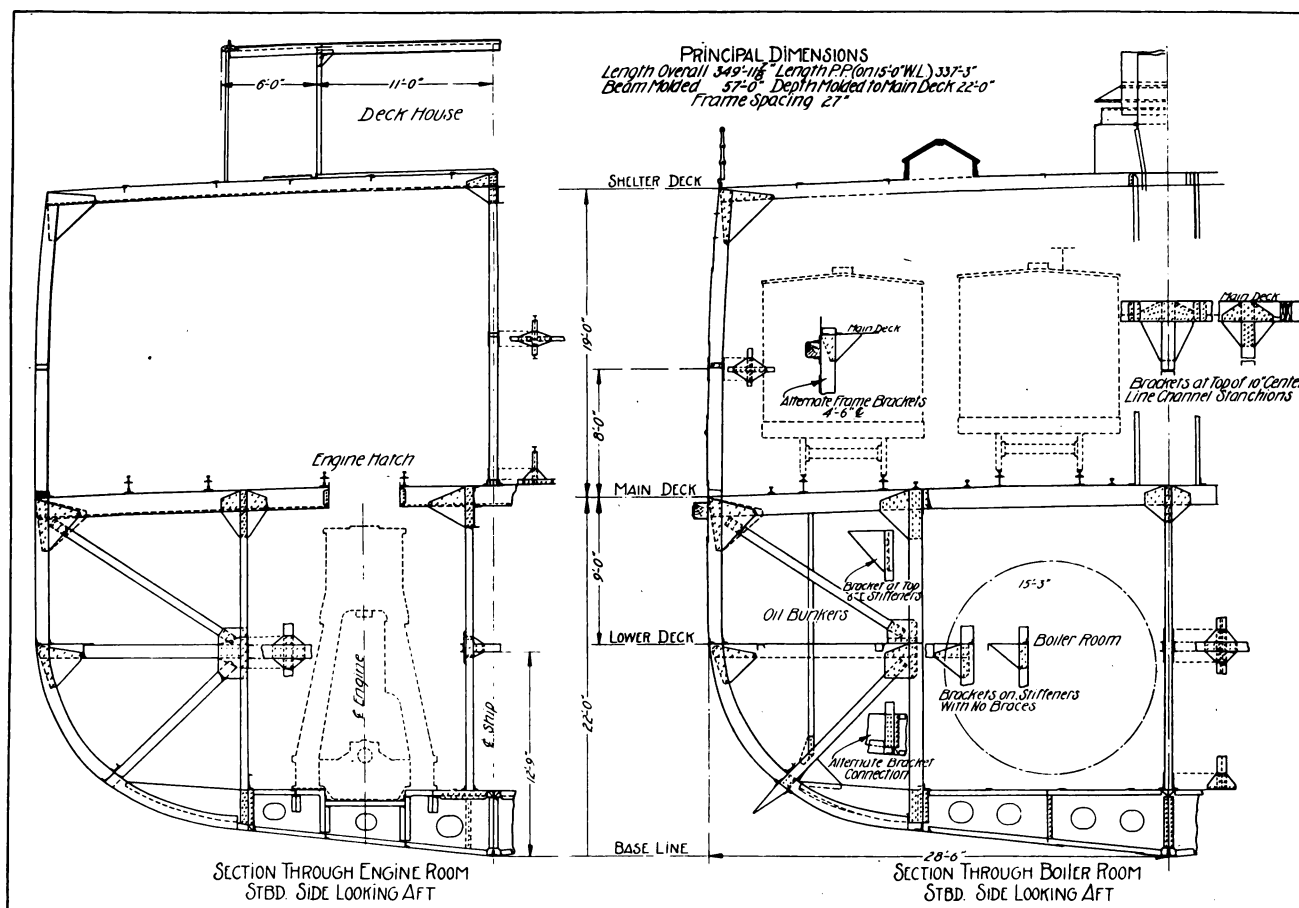
The cars are carried on the main deck, which is fitted with four railroad tracks. The stern of the vessel is of such shape as to fit neatly in the docks provided at Key West and Havana. The cars are loaded on to the vessel at the stern. Every appliance has been fitted for properly securing the cars at sea. When the cars are stowed, their weight is taken upon jacks fitted to jack rails, thus relieving the tracks from the surge and weight due to the rolling of the ship in a seaway. The quarters

for carrying molasses are also provided together with the necessary pumping apparatus for handling this cargo. Certain portions of the vessel are fitted with a double bottom for feed water, with large ballast tanks for service when the vessel is running light.

In addition to the provisions for purely commercial service, attention has been paid to the possibility of fitting her out as a gun boat and transport in case of war. Ample arrangements have been made to mount rapid fire guns of 5-inch caliber and smaller, as may be required. In brief, PARROTT will play her part in the preparedness program.

ble original data. Among the original methods developed by Professor Bragg are, a method of obtaining the mean bearing loads, the use of the mean lead in the solution of valve diagrams, and methods of designing turning engines and condensers.

The major portion of the text is devoted to the principles underlying the determination of cylinder dimensions, and to the design of the several engine parts. In chapters on cylinder dimensions, the important role of thermodynamics is emphasized. The section devoted to the design of engine parts pays particular attention to the im-



GENERAL CROSS-SECTIONS OF NEW CAR FERRY

of the officers and crew are on the shelter deck.

The propelling machinery consists of two triple-expansion reciprocating engines, of standard marine design, having 20, 32½ and 54-inch cylinders by 36-inch stroke. The engines will develop 1,350 horsepower at 100 revolutions per minute. The boilers are of the Scotch type, being single-ended, return-tubular, cylindrical boilers, 13 feet 2 inches in diameter and 12 feet long, fitted with two corrugated furnaces, 48 inches in diameter. The vessel is equipped with an electric light plant, electric mooring winches and winches for handling the cargo.

Two deep tanks of 600 tons capacity

Book Review

Design of Marine Engines and Auxiliaries, by Edward M. Bragg, professor of naval architecture and marine engineering, University of Michigan; cloth, 182 6 x 9-inch pages, 4 charts. Published by the D. Van Nostrand Co. and furnished by *The Marine Review* for \$3 net.

A comprehensive text on the design of marine engines must necessarily include data gathered from the experience of a number of successful engine builders. The author of *Design of Marine Engines and Auxiliaries* has not only presented the recognized standards of designs as followed by prominent engine manufacturers, but has supplemented this information with considera-

portance of the physical properties of the materials used for these various parts, to the selection of stock, and to so designing it that it will stand up under the variety of stresses imposed by service. The discussion of engine balancing includes the correlated work of a number of investigators. The remainder of the book contains information in regard to the design and function of auxiliary apparatus. Condensers and air pumps claim the greatest share of the author's attention. Turning and reversing engines are discussed in the concluding chapter of the book. The text is well illustrated and the information is presented in a manner that is unusually thorough and clear.

Naval Strategy Dominates Meeting

Society of Naval Architects and Marine Engineers Performs

Important Service for Preparedness—Many Papers Read

WITH every ship yard in the United States rushed to the limit of its capacity, the American merchant marine is rapidly forging to the front. Behind the merchant marine, protecting it in the performance of its duty, stands the navy, and it is now generally recognized that the navy and the merchant marine are mutually dependent. In view of this close relationship, it is only natural that a large proportion of the discussion at the twenty-fourth annual meeting of the Society of Naval Architects and Marine Engineers, which was held in New York City, Nov. 16 and 17, should have centered around naval problems. Out of 17 papers presented at the four half-day sessions, seven dealt specifically with naval subjects and two others were based on the researches of naval officers.

This group of papers forms an exceptionally valuable contribution to the literature of naval preparedness. The authors were wise enough to cut loose from the relatively narrow confines of naval architecture and marine engineering and strike out into the more broadly interesting questions of military strategy and naval policy. Among the papers in the latter category the following were particularly interesting: "Military and Technical Considerations of Battleship Design," by R. D. Gatewood, naval constructor, U. S. N.; "On the Suitability of Current Designs of Submarines to the Needs of the United States Navy," by Capt. W. L. Rodgers, U. S. N., and "Naval Stations and Naval Bases," by Capt. A. P. Niblack, U. S. N. In addition, a number of interesting papers dealing with problems relating to the merchant marine were presented. In this group were included papers on "Feathering Paddle Wheels," "Alquist Gearing for Ship Propulsion," "Electric Pumping Equipment for Tankers," "The Design of an Oil Engine," etc.

Membership is Growing

The report of the secretary-treasurer, Daniel H. Cox, showed that the society had 808 members of all grades on Nov. 1, 1916. There were four deaths and 14 resignations during the year ending Oct. 31, 1916. The financial statement presented by the secretary-treasurer showed that the society is in a flourishing condition.

The receipts for the year ending Oct. 31, 1916, were \$15,404.08 and the balance on hand Nov. 1 was \$1,340.79. The statement of assets and liabilities shows that the society now has total resources of over \$31,000, including \$20,000 invested in well seasoned bonds.

The annual address of the retiring president, Stevenson Taylor, president, American Bureau of Shipping, is published in full elsewhere in this issue. This address constitutes a masterly review of the shipping situation at the present time, including a forecast of future conditions which indicates that there will be a shortage of 6,500,000 tons of ships on the high seas at the end of 1918.

On account of the growing importance of the relations between the merchant service and the government, a resolution was introduced by T. M. Cornbrooks, chief engineer, Maryland Steel Co., Sparrows Point, Md., directing the council of the society to appoint a permanent committee to represent the organization in negotiations with the government. This resolution was passed unanimously.

R. T. Hall, rear admiral, U. S. N., presented the first paper at the Thursday morning session, Nov. 16. Rear Admiral Hall described a new device for indicating the density of smoke installed on the U. S. S. CONYNHAM. The apparatus includes a light transmitter installed on one side of the stack, a light receiver installed on the opposite side, and an indicating meter with suitable control appliances installed in the boiler room. A device of this sort is essential to the proper maneuvering of a destroyer, since it is occasionally necessary for vessels of this class to throw out dense volumes of smoke to screen the operation of ships of the line.

Following Rear Admiral Hall, Naval Constructor J. A. Furer presented an exhaustive paper describing the "Salvage Equipment Used in Raising Submarine F-4". This vessel, it will be recalled, sank in 304 feet of water outside of Honolulu harbor on March 25, 1915. The work of bringing the wrecked vessel safely to shore was divided into two parts. The initial salvage operations involved sweeping four-wire hawsers under the vessel, two forward and two aft. The ends of these hawsers were brought up

through mud-pocket openings in two large scows, and were attached to specially constructed windlasses mounted over the pockets. Two windlasses were installed on each scow, one for each hawser. By winding up the hawsers on these windlasses the vessel was lifted in the loops of the four slings. In this manner the hulk was raised and towed from its original position to a point where the water was only 50 feet in depth. To complete the operation, four cylindrical pontoons, 32 feet long and 11 feet in diameter, were made. These pontoons were filled with water and sunk beside the submarine. After being properly connected to the wrecked hull they were unwatered, giving a combined lifting capacity of 420 tons. This was 160 tons in excess of the estimated weight of the submarine. In this manner the operation was successfully completed.

Design of an Oil Engine

John F. Wentworth, naval architect, navy yard, Boston, Mass., read a paper entitled "The Design of an Oil Engine". This paper contains some interesting theories regarding the adaptability of low compression to diesel engine design. The paper will be published in a subsequent issue of *The Marine Review*.

"Aeronautics in Relation to Naval Architecture" was the title of a paper presented by H. C. Richardson, naval constructor, United States navy. F. G. Coburn, naval constructor, navy yard, Boston, Mass., read a paper on "The Power Forging of Chain Cables". This subject was covered thoroughly by Mr. Coburn in an article published in the March, 1916, issue of *The Marine Review*. E. A. Stevens Jr., assistant superintendent, Tietjen & Lang Dry Dock Co., Hoboken, N. J., read a paper entitled "Description and Trials of the Turbine Steam Yacht Winchester".

"Theory of Fluid Friction" and "Notes From the Model Basin" were the titles of two papers presented respectively by William Gatewood, naval architect, Newport News Ship Building & Dry Dock Co., and William McEntee, naval constructor, United States navy. These papers concluded the sessions on Thursday, Nov. 16. Mr. Gatewood's paper was discussed by W. L. R. Emmet, General Electric Co., Schenectady. Mr.

Emmet described a series of toboggan-boat tests of fluid friction made on the Erie canal at Schenectady, N. Y. Mr. Emmet's tests indicated that the actual friction at high speeds differs considerably from the calculated values obtained from formulas, due probably to the introduction of air under the hull. Francis B. Smith, chief engineer, Pittsburgh Steamship Co., Cleveland, told how the skin friction of large lake freighters apparently is reduced through the introduction of air under the hull when the vessels are going up the lakes light. Under these conditions, the boats plane well out of the water forward.

Naval Constructor McEntee's paper contains some data regarding the effect of roughness on propeller efficiency. From experiments on model propellers, Constructor McEntee's investigations showed that the effect of roughening the surface is to reduce the maximum efficiency from about 72 per cent to about 36 per cent. In discussing his paper, Professor Cecil H. Peabody, Massachusetts Institute of Technology, Boston, pointed out that while the results obtained in the model basin are interesting, they cannot be applied practically, since the resistance of propellers of different sizes does not follow any law of mechanical similitude.

Some Features of Battleship Design

In a paper entitled "Military and Technical Considerations of Battleship Design", presented at the opening of the Friday morning session by Naval Constructor R. D. Gatewood, it was stated that "the whole history of warship design has been a long series of steps toward increased displacement, and, except for our own battleships IDAHO and MISSISSIPPI and one or two classic examples abroad, there have been thus far practically no backward steps. By studying, even casually, the progress of the science of building warships, one is at once struck with the fact that the improvements effected in the various types have been made possible largely through this increase in displacement. The true increase that may be ascribed to increased size has been greatly confused because of many concurrent changes in other features of ship design and operation; stronger materials have made it possible to build lighter hulls, to use higher steam pressures and to install more powerful guns; new types of propulsive machinery have resulted in increased speed or greater fuel economy; improved processes of manufacture have decreased cost of construction. Always, however, an inevitable law of

growth has asserted itself and each successive vessel of every class has been larger than its predecessors.

"Since the ultimate purpose in modern war is the disruption and destruction of the organized forces of the enemy, the purpose of our battleship fleet is neither the defense of our coast, the blockade of the enemy's fleet in his ports, the capture of sea-coast forts, nor even the 'command of the sea'. Its mission—its sole mission—is battle, the complete and relentless destruction of the enemy's battle fleet. To this end it must possess at the outset and maintain by maneuver during battle that relative superiority which is the key of all decisive battles by land or by sea.

protect a greater tonnage, more economical propulsion, greater radius of action, greater sustained sea speed under all conditions of weather, and greater efficiency per gun due to the wide separation of turrets, machinery, magazines, etc., also on account of the greater safeguards it is possible to provide on the large ship with regard to the supply of power, ammunition and every other essential that serves the gun.

"Moreover, it is only large displacement which makes it possible to provide that adequate protection against underwater attack which is becoming more and more necessary and which cannot be provided with smaller displacements.

"These are the reasons that demonstrate so convincingly the value of the larger ship and that will force us inevitably to build larger and even larger units until such time as the improvement in submarine and aerial offense shall drive the present battleship type from the sea forever."

Strategic Inland Waterways

A discussion of Constructor Gatewood's paper was presented by Capt. Jacob W. Miller, vice president, Cape Cod Canal Co., New York. Captain Miller pointed out the strategic value of the Cape Cod canal in affording a short inside route between New York and Boston. In order to make the canal more useful in this direction he urged that it be deepened from 25 to 35 feet, and that the Hell Gate channel in New York City also be deepened. To perform the latter operation an appropriation of \$1,000,000 would be necessary. Professor W. Hovgaard, Massachusetts Institute of Technology, Boston, and Capt. William L. Rodgers, U. S. N., questioned the value of inside coastal waterways from a military standpoint, pointing out that it is necessary for the battle fleet to meet and destroy the enemy on the high seas. Such a waterway also was condemned as being too slow and tortuous.

Two more interesting naval papers followed Naval Constructor Gatewood's paper. The first, "On the Suitability of Current Designs of Submarines to the Needs of the United States Navy," was read by Capt. W. L. Rodgers. The second, entitled "Naval Stations and Naval Bases", was presented by Capt. A. P. Niblack, vice president of the society.

"Refrigeration and Refrigerator Insulation on Board Ship" was the title of a paper presented by Robert F. Massa. In this paper the author states that "in estimating the capacity of a refrigerating machine required for taking care of a given refrigerator, it is

The New Officers

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Secretary-Treasurer for 1917.

DANIEL H. COX.

This can be obtained most certainly, and at a much less cost per gun, by concentration of fighting power in large units.

"It has been shown that the fulfillment of the present-day claims on the military and technical characteristics of battleship design imperatively demands a ship of large displacement. It has also been shown how each element of a design can be benefited by an increase of displacement. Apart, however, from this gain, the larger ship possesses certain inherent advantages over the smaller one that more than outweigh the disadvantages due to size. These advantages include greater concentration of armament, better protection of buoyancy and stability by comparatively more minute sub-division, greater protection by armor because the thickness of armor need not be increased with displacement and the same area will

not sufficient to calculate the heat loss through the insulation of the refrigerator. In fact, this loss in many cases is very much smaller in proportion to the total loss than the average engineer realizes. It is proportionately so small, in fact, in the case of ordinary household refrigerators that almost all the builders of this class of refrigerator, after comparing the ice consumption in well and in poorly insulated boxes, use very low grade insulation in their stock boxes. Their custom, in general, is to reduce the size of the air passages leading to and from the ice compartment to a very small area and thus, by restricting the flow of air over the ice, they reduce the meltage to a minimum. The average purchaser of one of these refrigerators is more interested in economy of ice than he is in the temperature to be secured in the box. He assumes that the temperatures are all right but he knows each month whether or not the economy is right, when the iceman's bill comes in.

"Heat enters a refrigerated compartment through five avenues: *First*, through the walls, in other words, through the insulation; *second*, in warm goods; *third*, by the interchange of air through the opening of doors and by air leaks through defective insulation or through defective doors, cold air being heavier and immediately flowing out when doors are opened; *fourth*, from lights or from the heat of the bodies of workers; and *fifth*, from any change of state occurring in the goods, such as freezing, fermenting, etc.

A Sealed Refrigerating Machine

Mr. Massa's paper also describes the Audiffren-Singrum refrigerating machine. "This machine consists of a shaft with a pulley at one end, a drum at the other end, and a second drum at the middle of the shaft. The machine is carried in two bearings, one on either side of the central drum, and revolves with the central drum in contact with flowing water. The compressor, which is reduced to its simplest element because of its peculiar situation, hangs loose on the shaft inside the condenser drum and is held in position by means of a counterweight. The dumbbell is sent out from the factory completely charged and ready to operate. The air is entirely exhausted and a charge of sulphur dioxide and a pure neutral oil is admitted, after which the machine is hermetically sealed. The working parts are thus constantly lubricated, and the pressure in the condenser is constantly forcing oil between the working surfaces of the

compressors. Oxidation of the lubricating oil cannot occur as there is no oxygen present. It is impossible to draw air into the machine because the dumbbell is hermetically sealed. No dust can get access to the working parts, and, as a consequence, the wear on these machines is reduced to a minimum.

"The scheme of operation of the machine is simple. Devices are provided in the cold end of the machine for the return of lubricant from this end of the machine to the condenser end, and also for keeping the inner surfaces of the cold end of the machine thoroughly wet with the refrigerant. It is obvious that in a machine of this type the gas enters the compressors in practically a saturated condition. In consequence of this the compressors always operate automatically at maximum capacity, and there is no superheating of the gas with consequent loss in capacity.

"With this refrigerating machine it is possible to place the machine close to the refrigerator on account of the simplicity of its operation and the very small amount of care that is necessary, since there is no necessity for watching expansion valves or stuffing boxes, or anything of that kind. This, of course, means a considerable saving in heat losses through the piping, which losses are, in the case of small work, such as refrigerating work on board ship ordinarily is, quite important."

In a discussion of this paper it was brought out that sheet cork, recommended by the author for the insulation of refrigerating rooms, is not easily fitted to the irregular surfaces found on shipboard. In place of sheet cork one of the speakers recommended granulated cork. Although granulated cork is admittedly only half as efficient as sheet cork, its cost is considerably less. The same speaker recommended air locks to prevent heat losses from large refrigerating rooms. He also questioned the advisability of installing a hermetically sealed machine on shipboard where breakdown might occur thousands of miles from a properly equipped repair station.

Professor Herbert C. Sadler, University of Michigan, Ann Arbor, Mich., read a paper entitled "The Resistance of Various Types of Barges in Shallow and Deep Water". This was followed by a paper on "Feathering Paddle Wheels", by Prof. E. M. Bragg, also of the University of Michigan. Liberal abstracts from Prof. Bragg's paper are published elsewhere in this issue.

W. L. R. Emmet, consulting engineer, General Electric Co., Schenec-

tady, N. Y., presented an exceedingly interesting paper describing "Alquist Gearing for Ship Propulsion". This paper is presented substantially in full elsewhere in this issue. Hugo P. Frear, naval architect, Union Iron Works, San Francisco, submitted a paper describing the "Electric Pumping Equipment and Notes of Interest on the Union Oil Co.'s Tanker LA BREA". LA BREA is the first tank steamer to be equipped with independent submerged cargo pumps in each compartment operated by electric motors on deck. A liberal abstract of Mr. Frear's paper appears elsewhere in this issue.

The technical sessions were concluded by a paper by Elmer A. Sperry, president, Sperry Gyro Co., Brooklyn, N. Y., describing the commercial gyroscopic compass. This paper describes a new commercial type of gyro compass developed from the naval type invented by Mr. Sperry some years ago.

New Ward Line Service

The first ship of the Ward line (New York & Cuban Mail Steamship Co.) in the new service between New York and Salina Cruz, Mexico, JALISCO, has passed through the Panama canal on its way to Salina Cruz. JALISCO was the first vessel flying the Cuban flag to make the transit of the canal. There is to be in this service a ship every 21 days, the next one being MEXICO II. These vessels will stop at all ports between Balboa and Salina Cruz.

It is announced that the Seattle Construction & Dry Dock Co., which recently launched CAUTO, will soon launch PANUCO for the Ward Line. It is expected that the company will put these boats into service between New York and Salina Cruz. The line will carry both freight and passengers, though the freight business will be its most important feature.

Late Marine Patents

- 1,202,351—Submarine vessel. Charles A. Ballough, Daytona, Fla., assignor of one-half to Sumner H. Gove, Daytona, Fla.
- 1,202,525—Launching apparatus. Charles Hunt, New York.
- 1,202,526—Apparatus for launching lifeboats. Robert Huntington, Medford, Mass.
- 1,202,643—Collapsible boat. Ernest Ames, Peru, Ind., assignor of one-half to Robert E. Hite, Peru, Ind.
- 1,202,741—Internal combustion engine. Julius Landgraf, Briarcliff Manor, N. Y.

Pumping Equipment for Tanker

Details of Individual Submerged Electrically Driven Cargo

Pumps for Steamship *La Brea*—Turbine Drive Shows Economy

By Hugo P. Frear

THE steamship *LA BREA* is believed to be the first tank steamer to be equipped with independent submerged cargo pumps in each compartment, port and starboard, operated by electric motors on deck, and also the first to be fitted with reduction gear turbines. Otherwise the vessel differs little from many tankers built on the Isherwood longitudinal system of framing, and therefore these two items, especially the electric pumping system, will receive the most attention in this paper.

LA BREA is 435 feet in length, 56 feet in breadth and 33 feet 6 inches in depth, molded, and was the first vessel of this particular class built by the Union Iron Works Co., San Francisco. The contract was dated May 14, 1915, and delivery was made Feb. 29, 1916.

There have since been completed or contracted for, by the same builders, 13 additional tankers of the same scribe, all with pump rooms and ordinary pumping systems except one vessel for the Pan American Petroleum Transportation Co., which will have the same pumping system as *LA BREA*, but with only one pump to each transverse cargo compartment in lieu of two as fitted on *LA BREA*.

Ten of these additional tankers have

reduction gear turbines and three have triple-expansion reciprocating engines of approximately the same indicated horsepower as the shaft horsepower of the turbines. In each case the length of machinery space, forehold and overall length of the oil compartments, including pump room and coffer-dams, are the same. The position of the pump room, coffer-dams, length of fuel tank and length of some of the cargo tanks vary more or less to suit the owner's views.

Opportunity for Comparison

Of this class, the tanker following *LA BREA* was *LOS ANGELES*, also for the Union Oil Co. of California, but fitted with triple-expansion reciprocating engines, pump room and ordinary pumping equipment of standard capacity and efficiency. These two vessels, delivered within a month of each other and owned and operated by the same company, offer a most excellent opportunity for a comparison of their performances on the voyages so far completed.

For a general description of *LA BREA* the reader is referred to Fig. 1, showing the vessel afloat, and Fig. 6, showing profile inboard and decks. On account of the limited scope of this paper, attention is called only to the reduction gear turbines and location of cargo pumps and motors indicated on the profile inboard and upper deck. Tanks 1, 2 and 3 are much smaller

than the remaining tanks and have an independent discharge line. These were intended for light distillates, but have not been used for that purpose up to the present time.

The propulsion equipment, which was furnished by the General Electric Co., Schenectady, N. Y., consists of a Curtis turbine of the type developed for ship propulsion work, operating at a speed of 3,500 revolutions per minute, direct connected to a double reduction gear suitable for reducing the speed of the turbine to 90 revolutions for driving the propeller. The normal rating of the turbine and gear is 2,600 brake horsepower, with a steam pressure of 200 pounds at the throttle valve, 50 degrees superheat and exhausting into a vacuum of 28½ inches, measured at the exhaust inlet with the barometer at 30 inches.

The steam turbine consists of a forward 5-stage element and a 2-stage reversing element mounted on the same shaft and exhausting into the same chamber. Control of these turbines is effected by means of a throttling lever actuating balanced valves located respectively in the steam lines to the ahead and reverse turbines. Speed of the turbine is controlled by throttling, and there is also provided a hand-operated stop-valve in the reverse line which is normally kept closed while at sea, in order to prevent any possibility of leakage of steam into the reversing turbine. This

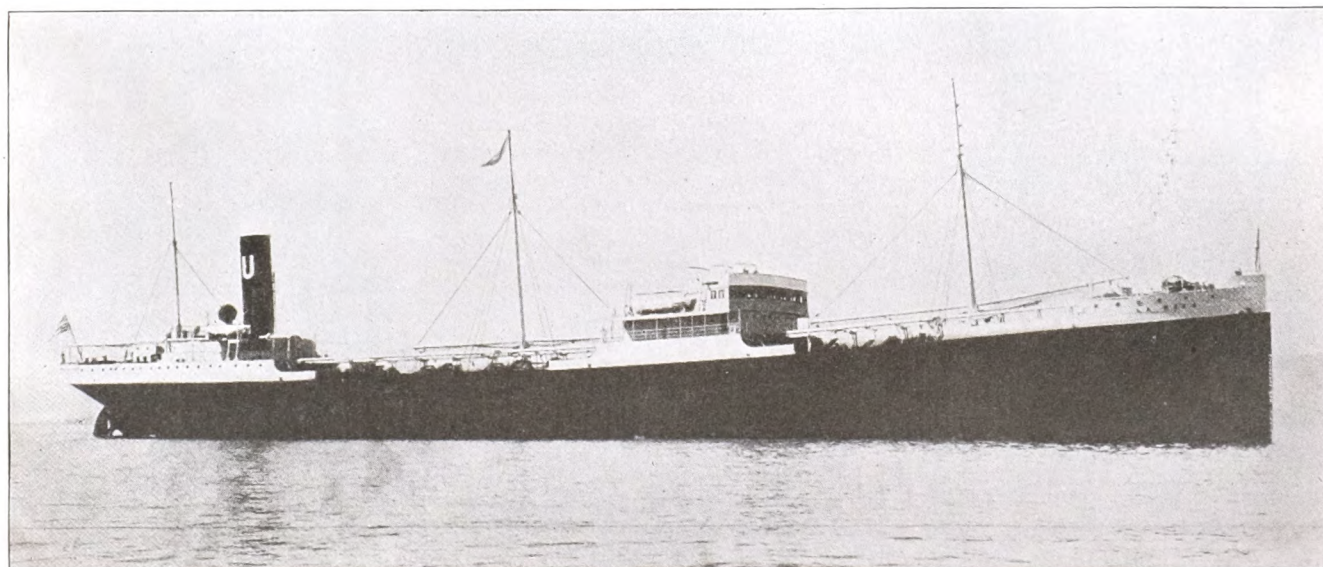


FIG. 1—SS. *LA BREA* IN BALLAST TRIM

valve is opened when it is desired to maneuver or make a landing.

The ahead turbine consists of five Curtis stages as stated above, the first or high-pressure stage carrying two rows of buckets and the remaining stages a single row of buckets. The buckets for each stage are mounted on a rolled steel plate wheel, into the periphery of which the buckets are dovetailed in a manner developed by the General Electric Co. and successfully used for many years to meet the severe requirements of central station turbines. Steam enters each stage successively through nozzles carried in the diaphragms between each stage.

The reversing turbine is of the same construction as the ahead turbine, with the exception that it consists of two stages only, of smaller diameter. The reversing turbine is capable of developing two-thirds torque and two-thirds speed with the same steam flow taken by the ahead turbine under normal operating conditions. The nozzle capacity, however, is greater than that of the ahead turbine, so that the requirement of reversing power may be considerably exceeded under normal operating conditions.

The reduction gears are of the helical type and are arranged to give two speed reductions, the high-speed reduction ratio being 5.03 and the low-speed reduction ratio 7.75, making a

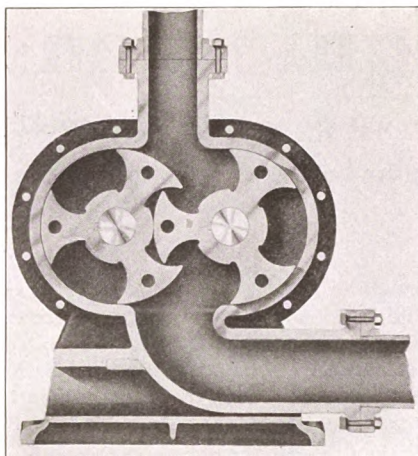


FIG. 2—DETAIL OF ROTARY OIL PUMP

total reduction ratio of 39.1. The high speed or driving pinion meshes with the two gears, one on each side, the three shafts lying in a horizontal plane. The low-speed pinions are mounted on the same shaft as the high-speed gears. The adjustment is such that work is divided equally between the two low-speed pinions.

Alquist Gears Used

The high-speed gears which are built in accordance with the Alquist patents and consist of a number of rolled steel plates, each 1 inch thick and thinned out near the center in order to give a certain degree of flexibility, thus insuring equal distribution of the work through the total face of the teeth. This construction has been found not only to give smoothness and lack of noise in operation, but has also resulted in a great reduction in the wear of the gears and pinions. Slip couplings are provided between the high-speed gears and low-speed pinions in order to prevent any movement of the main thrust shaft being transmitted to the turbine.

The turbine bearings and gears are supplied with oil under pressure of about 10 pounds. The oil is circulated by means of steam pumps which take oil from the main tank, where it is first forced through a strainer and then through a cooler before being delivered to the turbine bearings and the spray nozzles delivering oil to the gears. Oil is also supplied under pressure to the various bearings of the gears and pinions. The complete weight of the turbine and reduction gear, including all parts for the throttle valve and thrust shaft coupling, is about 110,000 pounds.

The electric cargo pumping system is the result of much labor and study on the part of O. B. Kibele, general superintendent of transportation of the Union Oil Co. of California, who, with the assistance of the San Fran-

cisco office of the General Electric Co., perfected all of the details.

The installation consists of 22 4-inch rotary pumps, built by the Union Tool Co., Torrance, Cal. They are designed especially for handling highly viscous oils, molasses and creosote, and are also fitted with a steam jacket for handling asphaltum. Each pump can deliver 350 gallons per minute against a total head of 350 feet at 200 revolutions per minute. The pumps are secured in the bottom of each compartment of the vessel, port and starboard to brackets that are integral with the tanks, and are driven by 40-horsepower, 3-phase, 60-cycle, 220-volt motors. The discharge lines for the three small tanks forward have nine 4-inch discharge gates, while the separate discharge lines for the remaining tanks have 14 6-inch discharge gates.

The motors are located on the upper deck in a watertight and gas proof casing. The drive to the pumps is through a set of bevel reduction gears and a vertical shaft which transmits the power through flexible couplings to the pumps. The shaft is entirely enclosed in a casing which serves as an oil reservoir, so that all of the shaft bearings and the pump gears are operated in an oil bath.

The pumps are each fitted with enclosed carbonized spiral gears, top

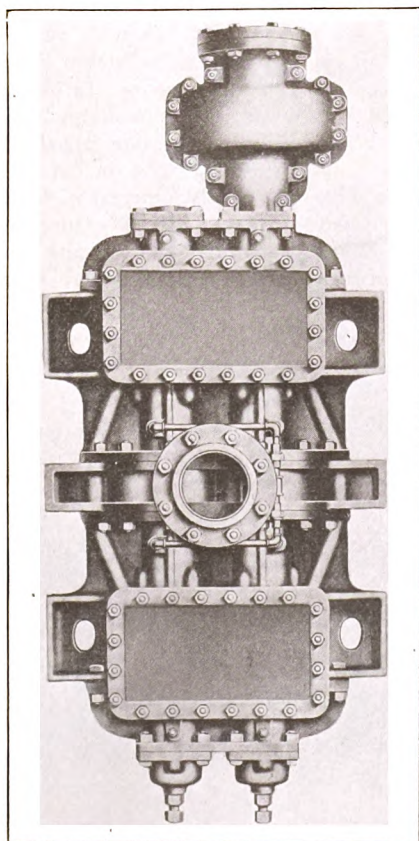


FIG. 3—EXTERNAL VIEW OF SUBMERGED CARGO PUMP

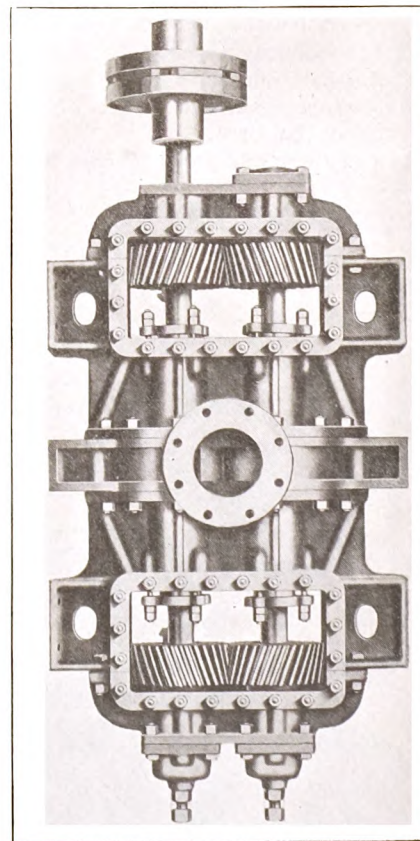


FIG. 4—CARGO PUMP WITH GEARS EXPOSED

and bottom, and operate with a minimum of noise. The vertical-drive shaft is hung on a ball thrust bearing contained in the gear case. They are fitted with 6-inch suctions and 6-inch discharges, so arranged that each pump can take suction from either or both compartments, port and starboard, at the same time, or independently. Cargo may also be discharged with one pump or as many pumps as can be put into operation at one time, depending entirely on the capacity of discharge pipes to the shore tanks. Any number of commodities can be discharged at the same time without mixing, depending, of course, on the number of discharge lines that are available to the shore tanks. The discharge lines from the pumps are so

elasticity in the event of one or more pumps going out of commission.

All operating valves are located on the upper deck. The motor control for starting the pumps is located in the main engine room and will be described in more detail hereafter. When it is desired to start any particular pump, the deck officer gives the signal to the operator in the engine room. The pumps are thus under direct control at all times by the engineer on watch.

Since LA BREA went into commission she has handled over 500,000 barrels of oil, and in each case the discharge was completed with a material saving in time as compared with vessels with ordinary pumping system. The capacity of the pumping system

each individual tank, the most logical way of driving the pumps was by independent electric motors. In determining the proper type of motor, several propositions were considered. Inasmuch as the drive of the pump was vertical, both vertical and horizontal motors were considered. Twenty-five cycle would have permitted using a slow-speed vertical motor suitable for direct connection to pump without any gearing, but this necessitated the installation of special 25-cycle turbine generating sets. The higher speed of 60-cycle motors required connection to pump through vertical gears if vertical motors were used, and this was not considered practical. The horizontal motors, whether 60 or 25 cycle, required the

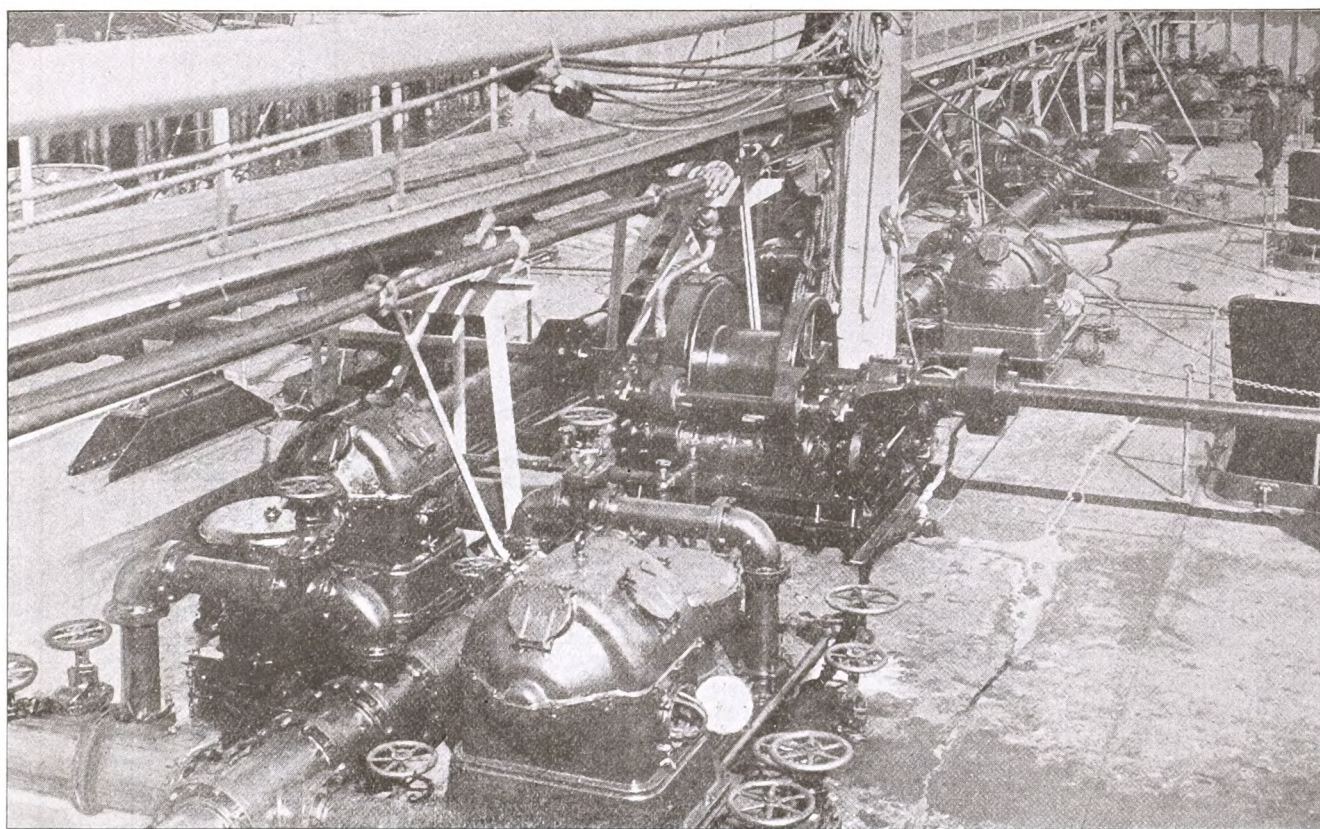


FIG. 5—DECK VIEW OF LA BREA SHOWING PUMP MOTOR INSTALLATION

arranged that they can be also used as filling lines to each individual tank, by means of a bypass around the pump.

Both Mr. Kibele and the writer, from the start, believed that half the number of pumps would meet all requirements, but finally decided to take no chances on the first installation. The better and more economical plan would be to connect the smaller number of pumps to a common 6-inch suction line, fitted with gate valves at each bulkhead and independent suction to each tank. This would enable each pump to draw from all or any of the tanks and insure maximum

is, of course, regulated by the capacity of the discharge lines and the pressure that the pumps are subjected to. On a low-discharge head, and with ample shore connections, the entire cargo could be discharged in approximately 10 hours' time. The maximum quantity of oil handled per hour against a pressure of 110 pounds per square inch is reported to be 4,200 barrels. The economy in fuel saved with this pumping installation appears to be approximately 45 per cent over the ordinary manner of discharging a liquid cargo.

After it was determined to use this system of pumping, with a pump in

use of bevel gears. All the power companies operating on the Pacific coast and the various refining and loading stations of the Union Oil Co. use 60-cycle current, and the installation of 60-cycle motors had the advantage of being able to use shore power to drive the cargo pumps if required.

Ordinarily the pumps and motors would be required to start up against line pressure, and this would necessitate a high-starting torque slip-ring motor with its necessary starting resistance and controller. With this type of motor there is sparking at the collector rings and the controller fin-

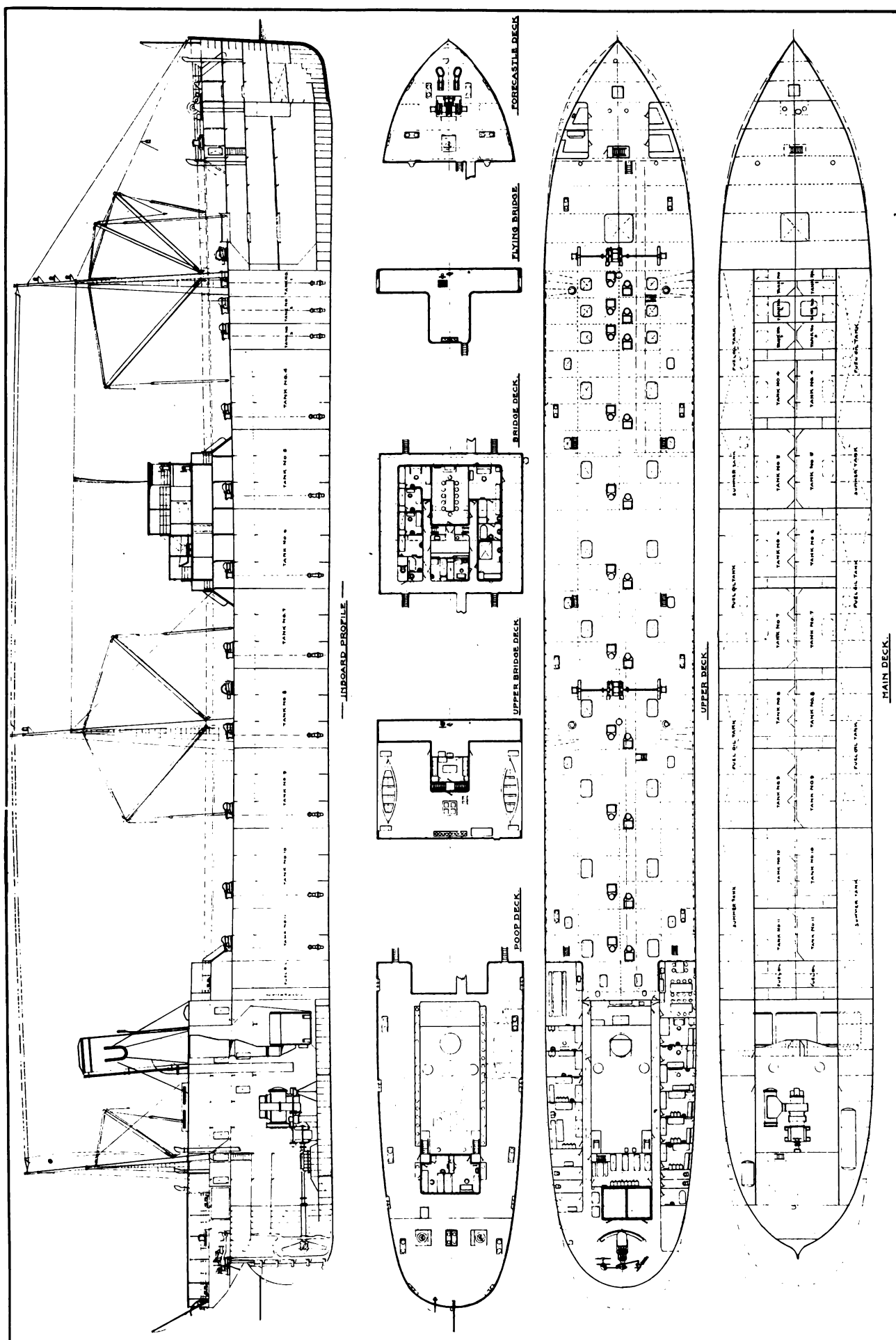


FIG. 6—DECK PLANS, INBOARD PROFILE AND GENERAL ARRANGEMENT OF SS. LA BREA

gers, and as the motors would be installed on deck where explosive gases might be present, this condition would be dangerous; consequently it was decided to use the ordinary squirrel-cage type. This motor, however, does not have torque sufficient to start a pump against full line pressure, and it was necessary to install a bypass on the cargo pumps. Pumps are brought up to full speed with the bypass open, which is gradually closed, at the same time opening up the valve in the discharge line. As already stated, there are 22 of these cargo pumps, and each is equipped with a motor of the following rating: Forty-horsepower, 600 revolutions per minute, 3-phase, 60-cycle, 220-volt, horizontal, squirrel-cage of the open type construction.

The motors are enclosed in a water-tight casing, as stated above, and this was made of cast iron. When loaded it is necessary for the motors to have proper ventilation, and the enclosing case is equipped with several hand-hole covers, which are opened when the motor is in service. The motors ordered for the next installation are exactly the same, except they are enclosed and no additional water-tight casing will be required.

One of the novel features in connection with this installation, and which is part of the switchboard, is the method of starting the cargo pumps. Ordinarily the practice is to use a starting compensator with each

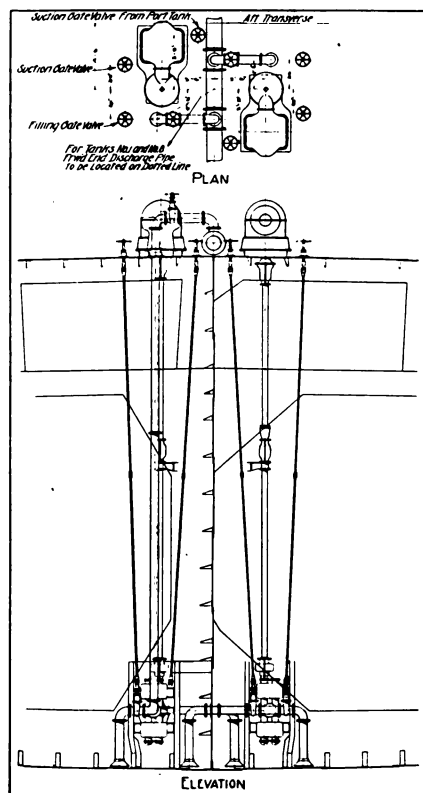


FIG. 7 — GENERAL ARRANGEMENT OF CARGO PUMP

Table I
Voyage No. 7 of La Brea Compared With Voyage No. 6 of Los Angeles

	La Brea July 1 to Aug. 9.	Los Angeles July 29 to Aug. 7.
Total distance steamed in knots.....	9,184	9,151
Average knots per hour throughout voyage.....	10.39	10.24
Average revolutions per minute.....	85.75	65.94
Average vacuum.....	28.61	26.72
Steaming time loaded and light.....	*	†
Fuel used steaming loaded and light, bbls.....	6,875	8,293
Fuel used per knot steaming, bbls.....	0.748	0.906
Fuel used in port pumping, bbls.....	107	186
Fuel used steaming and in port, bbls.....	6,982	8,479
Fuel used steaming and in port per knot, bbls.....	0.760	0.926
Cargo discharged, bbls.....	71,791.13	71,007
Time discharging, hrs.....	31 56 hrs. 17 min.	1,261
Average barrels per hour discharged.....	2,315.84	
Percentage less or greater fuel used steaming.....	Per cent less. 17.09	Per cent greater. 20.60
Percentage less or greater fuel used in port.....	42.47	73.80
Percentage less or greater time in port discharging.....	44.92	81.50
Percentage less or greater fuel per knot steaming.....	17.43	21.13
Percentage less or greater fuel per knot steaming and in port.....	17.92	21.84
Percentage greater or less barrels pumped per hour.....	Per cent greater. 83.65	Per cent less. 45.54

*36 days, 16 hrs., 50 min.

†37 days, 5 hrs., 6 min.

squirrel-cage motor. For various reasons it was not considered advisable to use any starting devices where the circuit would be made or broken on the upper deck, on account of possible presence of explosive gases, and a scheme was worked out by which all the motors were started from the engine room switchboard.

Arrangements were also made to start all motors from two compensators, one of which is a spare. This is accomplished as follows: The three panels controlling the cargo pump motors have running and starting buses, the running bus energized direct from the generators, and the starting bus through the compensators. The starting bus is not energized until the contactor at bottom of panel No. 4 is closed. The switches starting the motors are triple pole, double throw. The upper contacts are connected to the starting bus and the lower contacts to the running bus. When the switch is thrown into the upper position, the blades engage the contacts, but no power is available until the switch is pushed all the way in, which closes a small auxiliary contact, which in turn closes the main contactor on bottom of panel No. 4. This in turn energizes the starting bus through the compensators, and the motors start. An ammeter is installed in the starting circuit, which indicates when the motor is up to speed. When the motor is up to speed the motor switch is thrown into the lower position—that is, on the running bus—and the motor is then operating on full voltage. When throwing the motor switch from the upper to lower

position, the auxiliary contact is the first to open, which in turn opens the main contactor, with the result that the making and breaking of the starting current is made on the main contactor. Each motor circuit is supplied with three fuses, installed on a rack back of the switchboard to protect the motors from overload.

By referring to voyage seven of LA BREA and voyage six of LOS ANGELES, Table I, it will be observed that the destination in each case was Antofagasta, Chili, and that LOS ANGELES preceded LA BREA by two days. Notwithstanding LA BREA had been out of dock a month longer than LOS ANGELES and a greater time in warm water, it is stated that she could have overhauled LOS ANGELES and discharged first had the contrary not been arranged. The weather conditions were reported as follows:

LA BREA—July 1 and 2, rough following sea; July 3 to 7, fine weather; July 8, rough; July 9 to 12, fine weather; July 13 to 22, strong head wind and sea; July 23 to 30, fine weather; August 1 to 9, strong southwest wind and sea.

LOS ANGELES—June 29 to July 5, fine weather; July 6 to 10, fresh head wind and sea; July 14 to 17, strong head wind and sea; July 18 to 28, fine weather; July 29 to August 7, moderate head wind.

It will be noted that LA BREA consumed 17.09 per cent less fuel steaming, 42.47 per cent less fuel in port, 44.92 per cent less time in discharging, 17.43 per cent less fuel per knot steaming, 17.92 per cent less fuel per knot steaming and in port, and discharged 83.65 per cent more barrels of oil per hour.

Bright Future for American Ships

Annual Address of President of Society of Naval Architects and
Marine Engineers Contains Masterly Summary of Shipping Situation

By Stevenson Taylor

IT DOES not seem 24 years since an ardent few organized the Society of Naval Architects and Marine Engineers, though at times, most of the time indeed, has it seemed that never would American ship building come into its own. We have seen moderate ship building booms flourish for a short time and then wither to such proportions that ship building establishments were fortunate to have the building of cars, water-wheels, water-works and other manufactures for the land and government navy work that they might live.

We have seen within the past 12 years at least half of our large ship building companies in the hands of receivers or reorganization committees. We have also seen several yards starting with great promise but ending in disaster. Through these periods of alternate exaltation and depression, members of the Society of Naval Architects and Marine Engineers have retained their faith that some day the requirements of their country would change these conditions, and that there would arise such a demand for an American merchant marine that there would be no faltering in the future.

It was not foreseen, however, that Europe would be almost entirely engaged in the fiercest war of history, bringing about unbelievable conditions with which our own government or citizens had nothing to do, for they are innocent of causing or participating in the frightful destruction of life and property that at present appalls the world.

These conditions have brought to us the long looked for opportunity to build up our own marine commerce (as well as that of other neutral countries), and there is no reason for not availing ourselves to the utmost of this opportunity.

What Statistics Show

This address promises to be mainly one of statistics. Many sources have been examined to determine the probable facts. It has been extremely difficult to obtain exact results, but a careful consideration of all of the sources warrants the figures given here in round numbers, and these fig-

ures though perhaps not exact in themselves, do present conditions with sufficient accuracy to justify placing them on the record.

The year 1909 with a production of 1,602,057 tons represents low tide and the year 1913 with 3,332,882 tons the high tide, therefore the five-year period, 1910-1914 inclusive, fairly represents the average annual production of the ship yards of the world. This average was 2,740,000 tons gross. Of this amount the United Kingdom launched about 60 per cent, or 1,650,000 tons; Germany launched about 12 per cent, or 330,000 tons; the United States launched $9\frac{1}{4}$ per cent, or 253,000 tons; France launched $4\frac{1}{2}$ per cent, or 121,000 tons, and all other countries, including Great Britain's colonies and Canada, launched about 14 per cent, or 385,000 tons.

Nearly 50,000,000 Tons of Ships

In the year ending June 30, 1915, the entire tonnage of the merchant vessels of the world amounted to 49,262,000 tons. The United Kingdom owned 43.5 per cent, or 21,300,000 tons; the United States owned about 12 per cent, or 5,900,000 tons; Germany owned 10 per cent, or 5,000,000 tons; and France owned less than 5 per cent, or 2,300,000 tons.

Taking the greatest tonnage of merchant vessels launched by any nation in any one year of all the years 1899 and including 1915, and combining the figures and we have a fair estimate of the capacity of the world's ship yards. These figures give a total capacity of 3,685,000 tons per year, of which the United Kingdom, colonies and Canadian lake ports launched 54 per cent, or 1,984,000 tons; the United States coasts 14.6 per cent, or 540,000 tons; Germany 12.4 per cent, or 465,000 tons; and all other countries 19 per cent, or 696,000 tons.

In 1914 the building of merchant vessels was reduced by the European war to a minimum in all countries, the nations at war turning their attention almost entirely to the construction of war vessels or munitions, while in the neutral nations it seemed as though marine as well as all other merchant business had come to an end; but in the last two years there has come on us a mighty change.

The destruction of some as well as the interning of the remaining merchant vessels of the Teutonic Allies; the commandeering of others by both sides, and the great destruction of merchant vessels of all nations, including neutrals, amounting now to 5,000,000 tons, has so reduced the number of available ocean ships that in order to transport the immense purchases of Europe and to furnish other ocean transportation there has arisen a demand never before seen for old as well as new ships, for anything indeed that could be used for ocean service.

The result has been that in the United States especially every vessel afloat, some extremely old, but every one available for the service, has greatly increased in value; every ship yard has been filled with orders for approximately two years and many new yards have been established for building steel vessels; many old yards that built wood ships have been resuscitated and many new yards also started for building wooden vessels.

We are today, in our own country, in the midst of a ship-building boom unequaled in history. It is to be remembered that command or freedom of the seas, depending on the point of view, is one of the very important causes of the war abroad and that whatever may happen on land, at least Great Britain, Germany, France and Japan have the intention of being prepared, the first to hold and better if possible, its present superior position, and the others to increase the value of theirs while the United States must now, if ever, regain its once formidable place on the seas of the world. There must naturally from these conditions come a great competition which will enlist all of the skill and efficiency of every nation having a merchant marine.

A Forecast of the Future

What is the condition today of the merchant fleets and what will be the tonnage requirements and the capacity of the world's ship yards in 1918? We have seen that the greatest production (the measure of capacity) of the world's yards up to 1915 was 3,687,000 tons. We estimate that in the year 1918 the capacity of the

world's ship yards will be about as follows:

	Tons.	Increase, per cent.
U. K., Colonies & Canada	2,260,000	14
U. S. coasts & Gt. Lakes	826,000	53
Germany	605,000	30
All other countries	809,000	16
Total	4,500,000	23½

The normal tonnage of the world this year amounts to about 50,000,000 tons. Of this there has been 5,000,000 tons destroyed, 12,000,000 tons commandeered, and 4,400,000 tons interned, making total withdrawals of 21,400,000 tons. This leaves available at present for regular service not more than 28,600,000 tons, or 57.2 per cent of the normal tonnage, which readily accounts for the present high freights and high values placed on old vessels.

Presuming that peace will be restored by the end of 1917, we have the following conditions:

Present available tonnage	28,600,000
Commandeered and interned ships released	16,400,000
Probable production in year 1917	3,000,000
Total	48,000,000
Less future destruction, scrapping and depreciation	4,000,000
Leaving an available tonnage of	44,000,000
At the end of 1918, should peace be restored, there will certainly be required	55,000,000
Available at end of 1917, as above	44,000,000
Estimated construction 1918	4,500,000
	48,500,000
Still leaving a tonnage deficit at end of 1918 of	6,500,000

From the foregoing it will be seen that high freights and high prices will continue and ship yards will be busy for some years to come, and it behooves all concerned, the government, owners, builders and shippers to see that we obtain our share.

The Norwegians Again

As to the increase in American merchant marine, flying the "Star Spangled Banner", the situation may be quite different, though we still hope not. At present the ship yards of the United States are building nearly 1,500,000 tons of steel and over 50,000 tons of wood vessels to be finished during the next two years. Of these at least 700,000 tons are for foreign account and from reports recently received this tonnage will be increased, so that about one-half of the vessels now contracted for in this country will fly foreign flags, mostly the flag of Norway.

At the present high freights, notwithstanding the high cost of building, owners can well afford to pay the difference between operating under the American flag and that of a foreign country, but possibly future conditions may change the special advantage we now possess.

The European war has aided the

merchant marine in the number of vessels registered as well as in the number contracted for in American yards. To Sept. 26 last there were in all 196 foreign built vessels of 642,802 tons admitted to American registry, but there were 261 American built vessels of 151,676 tons sold to foreigners, leaving a balance of 491,126 tons, almost 10 per cent increase in tonnage of American registry.

When the war ceases and the competition before referred to commences, it will be the privilege of the United States government to aid ship owners to obtain their share of the freights then paid, be they high or low.

What sort of protection, if any be necessary, shall be provided, and what changes in existing laws containing burdensome clauses shall be made, remain to be seen and upon the lately authorized shipping board with its

eign companies. As in other features of our business, we have been too busy with our inland matters to appreciate the worth of attention to marine insurance.

Only six months ago we were told that ship owners must go abroad for their insurance and having had that habit for years it still was thought necessary. But we are now in quite a different position, for insurance has been placed in this country for large amounts on single ships, and, wonder of wonders, insurance is being placed here for foreign owners.

Here we should note the result of our own government's operation of war risk insurance. From Sept. 2, 1914, to July 31, 1916, the United States government issued 1,539 policies, insuring \$138,392,389 on American non-contraband cargoes, for which it received \$2,904,886, with net losses amounting to \$712,578, making a gross profit of \$2,192,384. Deducting salaries and operating expenses of \$32,982, leaves on policies issued during 22 months, a net profit of \$2,159,416. Perhaps the government cost did not cover all of the charges to which private insurance companies would be subject, nevertheless the experience warrants the careful attention of insurers as well as insured.

Nativity of Crews

One of the grave questions that arises in consideration of the American merchant marine is the one concerning crews. We do not suppose that at any time in the past crews of American ships were all native born, but it is quite certain that for a good many years the number of native born Americans serving on ships has gradually been decreasing. In 1909 about half of the crews on American ships were natives of the United States, while last year the proportion was reduced to 43 per cent. We believe that there still remains something of the romance of the sea and its sailing ships, and given a world-wide trade our ships will attract more and more of our natives to service on board. We also have the alternative, the employment of those of foreign birth who will become our citizens. Here, as in other industries, the kind of immigration matters greatly. Our laws covering the question of physical and mental fitness must be strictly enforced. It would then seem that our American ships would be attractive to the best of sailors of whatever birth.

It is to the credit of William C. Redfield, secretary of the department of commerce, that he called into service naval architects, ship builders, owners and operators to aid by confer-

extensive power depends such recommendations to congress as shall best be enacted.

Announcement has not yet been made of the personnel of this board, but we have no doubt that it will be of high character and that it will possess a general knowledge of the whole subject. Certainly the shipping board will have an opportunity to afford great assistance and encouragement to those who desire to own and man ships to carry our flag over the seas and to do our share of the world's commerce without expending an undue amount of the \$50,000,000 appropriated for its use.

In this connection it is interesting to note the establishment of the Belgian Shipping Co. under the auspices of the Belgian government, with a capital of 50,000,000 francs (\$9,650,000), and of which all officers must be Belgian, born in Belgium; all stockholders must be Belgian, and no stockholder can be a partner or director of other companies of which the majority is not composed of Belgians, born in Belgium.

There has been recently one great change favorable to a firm establishment of an American merchant marine. For years the matter of marine insurance has been mostly left to for-

ences in the solving of two very important questions relating to vessels.

The first conference, held last May, on the subject of reducing the fire risk resulted in the testing by the United States bureau of standards of all sorts of materials that may render construction of vessels fire-proof or nearly so. When these tests shall have been completed, the competent committee appointed will report its recommendations.

The second conference, held last September, discussed the subject of subdivision of ships by bulkheads, and the equally important subject of assignment of load lines above which ships must not be loaded.

These subjects were referred to a committee of nine, seven of whom happen to be members of this society. It is needless to say that this committee, composed of naval architects, builders, owners and the president of the classification society, the American Bureau of Shipping, will give the subject the most careful attention that it may be able when the time comes to give such information and advice to government officials as they may require. Subjects like the subdivision of ships by bulkheads, and assignment of load lines should be as far as possible treated as international.

For transoceanic service we should adopt the rules suggested by the conference on safety at sea, held in London in 1913-1914. There still remains what appears more difficult of solution, our own Atlantic coastwise, Pacific coastwise and Great Lakes services, each of which, brings problems of its own, requiring the utmost careful consideration.

A Look Into the Future

"Watchman! tell us of the night, what its signs of promise are!" We remember too well the conditions that suddenly came upon our country in August, 1914, and the predictions of important men of this community, particularly those of financiers, none of which came true; though it is only fair to say that no prophet arose to say them nay. In these days, predictions and warnings about the future are made by great men and read with interest, but we hesitate to indulge in prophecy.

So far as ship building is concerned, the figures already given for merchant vessels now being constructed and to be built hereafter prove that we are on the eve of great prosperity. Make from these statistics your own analysis. Mine is to the effect that there is before us a prosperous period of at least five years in which we can improve our facilities and meth-

ods so much that there will be no question of our ship yard efficiency and ability to meet competition, provided that our government and shipping board really reason together face to face with our ship owners, ship builders and shippers, and determine to adopt the best policy to advance that most necessary and beneficial feature of our industries, an American merchant marine. Let there be no more periods when our grain and produce cannot be delivered for want of American ships, or times when any foreign government shall say what non-contraband can or cannot be shipped from our own ports.

Only the merchant service has thus far been considered, but the navy must not be forgotten. Add to the merchant ships which must be built in our yards the proposed increase

No Chance for Failure

I see no chance of failure in the future. We need men, but they will come from the warring nations, tired of their systems of government and rejoicing to become American citizens. Men, too, will be raised to find their opportunity in the steadily alive shipyards of the future. Our nation will again be a great maritime nation, holding its own among the other great nations of the earth.

To feel otherwise would be a confession that our great Republic—now 141 years old—is a failure in self-government, enterprise, industry, efficiency and foresight, an appalling failure in those qualities that make great men and great nations. This surely cannot and must not be.

in the navy, for which 66 ships of various classes are soon to be contracted for, at an estimated expenditure of \$185,560,000, without armor, armament or navy ammunition, for which \$66,595,000 more is required. Consider that included in this appropriation are the new battle cruisers. The design of these battle cruisers is the most wonderful of all steps in the progress of designing skill, for in these ships are massed unprecedented power and unequalled speed and means of offense.

The big oil carrier, WILLIAM ROCKEFELLER, 10,000 tons, owned by the Sun Oil Co., has been launched. The ship, which is one of the largest additions to the American merchant marine, is constructed throughout of steel, with double steel decks. She is schooner rigged, having two steel masts. She has a speed of 11 knots. A number of executives of the Standard Oil Co. were in the launching party.

All Records Smashed

Ore shipments during November amounted to 5,715,452 gross tons, an increase of 1,270,323 tons over the movement for November, 1915. Total shipments up to Dec. 1 of the present season aggregated 63,648,298 tons, compared with 46,261,568 tons brought down up to Dec. 1, 1915. The November figures show a considerable decrease from the October shipments, which totaled 9,116,196 gross tons. This decrease was the result of the let-up which occurred during the last half of November, due to weather conditions, when vessels suffered from five to nine days' delays at docks, owing to the difficulty of handling frozen ore.

It is expected that the December shipments will set a new record for that month, as some loading contracts have been made up to Dec. 12. That the season's shipments for 1916 will approximate 65,000,000 tons is assured, as it is reasonable to assume that the fleet this year can double the record made in December, 1906, when 540,588 tons were brought down.

Following are the shipments by ports for November and up to Dec. 1 for 1915 and 1916:

Port.	November, 1915.	November, 1916.
Escanaba	696,346	772,417
Marquette	263,386	273,801
Ashland	451,020	665,339
Superior	958,465	1,132,642
Duluth	1,328,848	1,982,872
Two Harbors	747,064	888,381
Total	4,445,129	5,715,452
1916 increase		1,270,323

	To Dec. 1, 1915.	To Dec. 1, 1916.
Escanaba	5,636,427	7,279,899
Marquette	3,099,589	3,820,452
Ashland	5,146,772	7,935,185
Superior	8,307,381	12,626,473
Duluth	15,437,419	21,455,345
Two Harbors	8,633,980	10,530,944
Total	46,261,568	63,648,298
1916 increase		17,386,730

Ore Receipts

Out of a total of 5,715,452 tons of ore shipped during November, 5,055,239 tons were received at Lake Erie docks, as follows:

Buffalo	726,448
Erie	266,764
Conneaut	808,066
Fairport	231,328
Ashtabula	1,088,587
Cleveland	948,497
Lorain	494,822
Huron	127,053
Toledo	293,292
Detroit	70,382
Total	5,055,239

The Terry Steam Turbine Co., Hartford, Conn., announces the appointment of Stephenson & Nichols, Monadnock building, San Francisco, as its representative in northern and central California and the northern part of Nevada.

New Gearing for Ship Propulsion

A Description of Alquist Gearing With a Discussion of
Its Advantages—Gear is Built-Up of Flexible Plates

By W. L. R. Emmet

THE designs described in this article are based upon the inventions of Karl Alquist. Mr. Alquist was formerly connected with the turbine department of the English branch of the General Electric Co., the British Thomson-Houston Co. His gear inventions were first brought to the attention of the writer early in the year 1911. For some time previous, Mr. Alquist had endeavored to arouse interest in his methods in England and on the continent but had accomplished nothing. At that time the General Electric Co. had not begun the commercial manufacture of high-speed spiral gears, but had for some time been conducting experiments to determine the limits of speed, pressure, etc., which were practicable with such gearing. The importance of high-speed gearing in connection with turbine and electrical applications is obvious and we were working with a view to development

A paper presented at the twenty-fourth general meeting of the Society of Naval Architects and Marine Engineers, New York, Nov. 16-17, 1916. The author, W. L. R. Emmet, is associated with the General Electric Co.

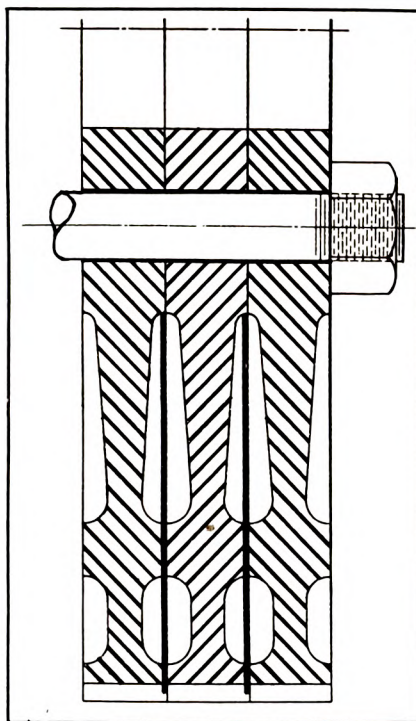


FIG. 1—DIAGRAM OF ALQUIST GEARING

of the best standards. Certain features of Mr. Alquist's proposals appealed strongly to the writer, and arrangements were made with him to come to America and assist in experimental developments along the line of his inventions.

Many Sets Built

The result of this undertaking has been that many sets of gearing have been built and experimented with exhaustively under a variety of conditions, and by these experiments certain standards of practicability have been established and extensive commercial developments have been undertaken. Gearing of this character has been applied to about 72 sets where steam turbines drive electric generators of various types. Contracts have been closed for machinery for the propulsion of 70 ships aggregating 215,200 horsepower. Some of these electric generating sets have been in service 1½ years and about seven of the ship sets are in service, some of them having made many long voyages. Among these are high-pressure cruis-

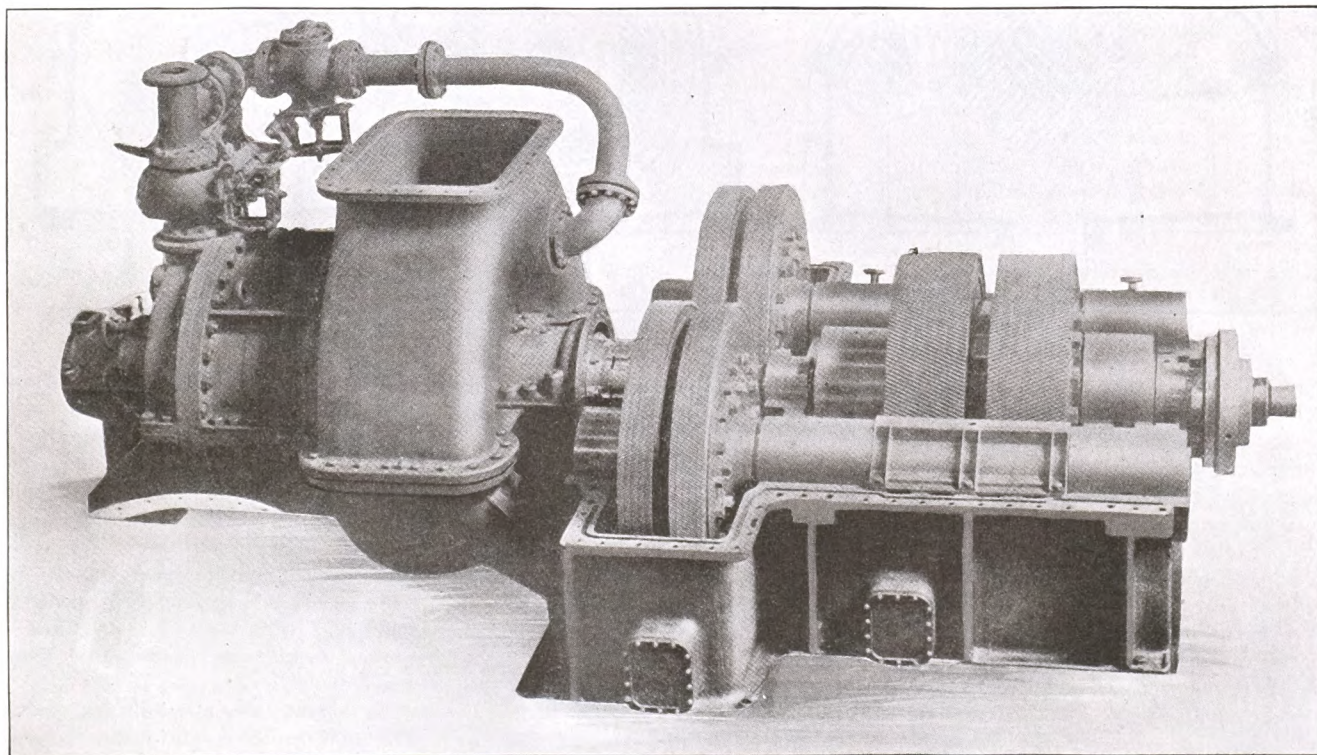


FIG. 2—CURTIS TURBINE AND ONE-PLANE FLEXIBLE-TYPE SPEED-REDUCTION GEAR FOR SHIP PROPULSION
—TOP HALF OF GEAR HOUSING REMOVED

ing units for the battleship NEVADA which have been in service for some time and shown good results. Among the ship equipments not yet completed are included the propelling machinery for DESTROYER No. 69, built at Mare Island, and new propelling machinery for the scout cruiser SALEM. In all of this practical experience no case of trouble with gearing has developed and no appreciable deterioration of gears has been observed.

One of the important reasons for adopting this type of gearing was that its design tended to afford a distribu-

tion in this gearing is simple. The gear is built up of a number of plates machined to a form which gives them the desired degree of lateral flexibility. These plates are put together, engaging solidly at the hub and also engaging on a narrow edge at the periphery. When so built together they form a solid cylinder which can be spirally cut in the ordinary manner. After cutting, the edge engagements are relieved with a small dividing tool so that each disc operates independently and is free to deflect laterally under the side pressure which

place, where gears are inflexible there must always be a tendency to increase strain at the loaded end of the pinion through torsional deflection of the pinion. There is also a tendency to inequality of strain on different parts of the surface through the lateral deflection of the pinion under load. These inequalities can be partially compensated by elevating the bearings or evening the pressure on the bearings, but this compensation can only be partial because the correction applies only to the two ends and not to the middle. Further-

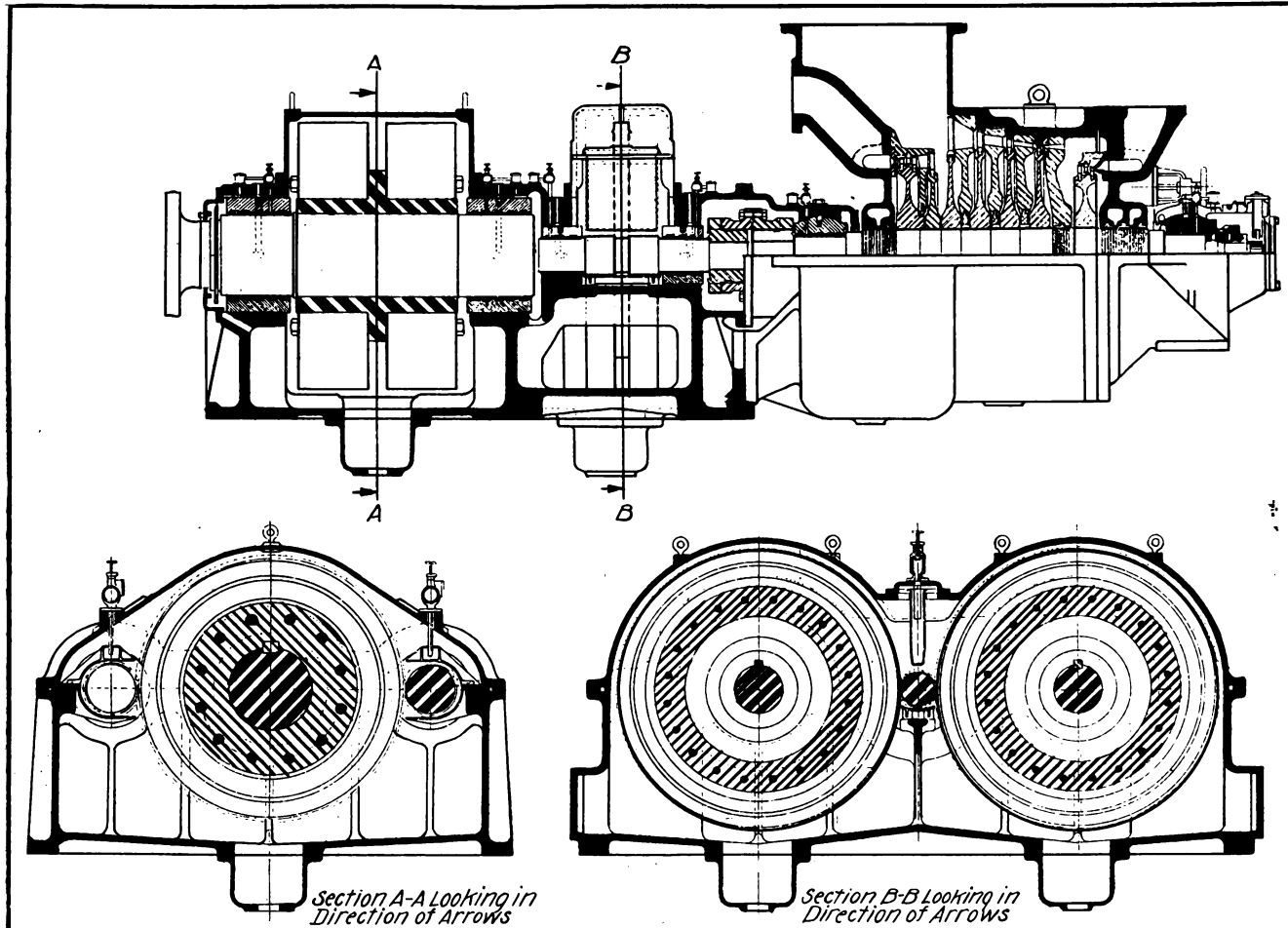


FIG. 3—ASSEMBLY DIAGRAM OF CURTIS GEARED TURBINE ONE-PLANE TYPE FOR MARINE PROPULSION

tion of strains and means by which excessive strains would not be imposed upon any part through slight imperfections, distortions or inaccuracies. The uniform success which has been accomplished with an entirely new product shows that this expectation has been amply justified. Some of the gears which have been used have been very imperfect, both in the matter of material and workmanship, and have been used under extremely trying conditions. That they have not failed has afforded the strongest evidence of the general reliability of the method.

The character of construction used

results from its diagonal engagement with the pinion. The parts are so proportioned that this lateral deflection can at no time involve fiber strains which could possibly cause destructive fatigue. A very small amount of this lateral deflection is sufficient to afford the desired distribution of load and this amount can easily be given without approaching dangerous periodic strains.

Inequality of Strain

To appreciate the value of this flexibility and load distribution, various peculiarities of solid and spiral gearing must be considered. In the first

more, the momentary and periodic strains on different points of solid spiral gearing may be seriously affected by vibrations of supporting structures, irregularities of machine work or gear cutting and other causes. If for any reason such conditions cause any tooth or part of a tooth to receive periodically excessive strains, fatigue may result and a broken tooth may destroy the whole gear.

To obviate the possibility of breakage under such conditions, it is often desirable in solid gearing to use relatively large teeth in order that these possible irregular strains on teeth or

parts of teeth will not involve danger of breakage. For other reasons, however, the use of large teeth is distinctly undesirable in spiral gearing. Spiral gears tend to engage by point contacts at or near the pitch line, and the ability of these point contacts to bear pressure without fatigue of the surface metal is governed largely by the flatness of the surfaces engaging rather than by the size of the teeth carrying these surfaces. The flatness of the surface is a function of the pinion diameter and not of the pitch. If we double the number of teeth in a spiral gear we have twice the number of driving points in action, and the flatness of all of these points is the same in both cases if the pitch diameters are the same. These matters are illustrated in the sketches in Fig. 1.

With gearing of the Alquist type we can use very small teeth without any danger of incurring excessive strains on individual teeth, which might involve risk of the development of fatigue cracks. In this connection it should be borne in mind that experiments have shown that the strongest steel, if subjected to periodic deflections, will break after a fiber strain of 20,000 pounds per square inch has been applied a million or more times.

In the work which is now being done by the General Electric Co., gears of the type described are applied in three ways. First, a single reduction has been accomplished by engaging one solid pinion with a flexible gear of this type; second, by engaging a solid pinion with two flexible idlers, which idlers in turn engage with a solid large gear; and third, in a double reduction where a solid, high-speed pinion engages flexible gears on two counter shafts, these counter shafts carrying solid pinions, both of which engage a flexible gear on the same low-speed shaft. In these two latter applications the flexibility of the gears serves to equalize the loads between all of the driving points, and the use of a plurality of driving points on the large gear reduces the length of face necessary on that gear.

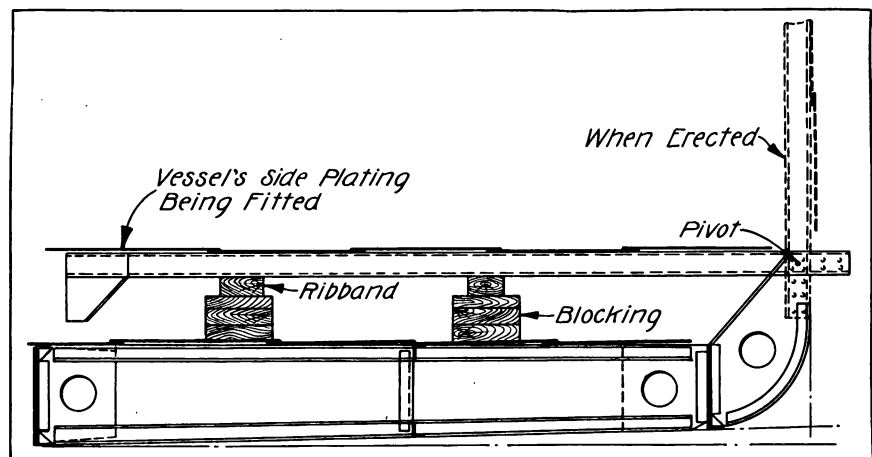
In both of these cases where a single high-speed pinion drives two flexible gears, other very positive advantages are accomplished. The pinion is relieved of bending strains, and pressure on the high-speed bearings is avoided.

Experiments have been made in Schenectady which carefully analyze the losses of high-speed gears under various conditions of load and pressure, and these experiments have indicated that low peripheral speeds are

more efficient than high speeds. With solid gears, low speeds involve difficulties because they diminish pinion diameters and increase pinion lengths, thus complicating the troubles which may arise through deflection and torsion of pinions and pressure upon pinion bearings. Since the flexibility of Alquist gears enables us to compensate easily for all possible degrees of torsional yield in the pinion, we can with such gears safely reduce peripheral speeds by making the gears longer and of smaller diameter. Such reductions of diameter diminish weight and improve efficiency, and the fact that the Alquist method makes such reductions possible constitutes one of its important advantages.

serious problem as the weights involved would never greatly exceed 1,000 pounds per running foot and in very large vessels the dead flat could be built and raised in convenient sections. The method is only advised for the construction of modern cargo carriers with a considerable percentage of uniform middle body.

Care would have to be taken that in the elevating, the structure is kept in one plane. The proper place to locate the jacks or rams can be easily estimated. Assuming that the weights along the frame length are uniform and that it is desired to so locate the point of contact with the jack that the bending moment on the beam between the jack and the pivot point equals the



SUGGESTED METHOD OF SHIP ERECTION

Method of Ship Erection

By John A. McAleer

In these days of high costs it would seem that any suggestions in the way of economy that can be advanced should be put forth. The following method is offered as an improvement over the orthodox method of erecting a steel ship. Instead of erecting the frames one at a time, fairing and finally putting on the plating, the frames are first located horizontally, extending inwards above the tank top, with their outer, bilge ends, bolted in their proper ultimate position by a good service bolt through the frame end and bilge bracket. When all the dead flat frames, or as many as is deemed convenient are so placed, they are faired, the stringers are put in, and the plating is put on, and riveted and caulked. After this has been done, the whole side can then be elevated to its final position and the remainder of the bilge fastenings adjusted.

The advantages of this method are apparent. There will be no staging, as all the work can be done horizontally and very accessibly.

The elevating work would not be a

bending moment on the cantilever beyond the contact point, the proper location for the jack will be at a point 80 per cent of the frame length from the point of pivot. Taking moments about these two points, i.e., the pivot point and the point of contact of the jack, it will be seen that three-eighths of the weight per frame space is on the pivot and five-eighths on the jack or ram, when the structure is horizontal. The accompanying sketch roughly depicts the operation.

Receipts of grain at Buffalo during October amounted to 16,451,267 bushels, compared with 47,770,143 bushels received in October, 1915, a decrease of about 29,000,000 bushels.

The steamer A. D. DAVIDSON, formerly engaged in lake traffic, is believed to have foundered en route from Montreal to Havre, France. A life boat marked A. D. DAVIDSON has been washed ashore at Perranporth. DAVIDSON was sold by the Great Lakes & St. Lawrence Transportation Co., Chicago, several months ago, to the French government, and left Montreal Oct. 4 for Havre.

American Lloyds Widens Its Scope

President Taylor Announces American Bureau of Shipping Has
Absorbed Great Lakes Register and Formed English Connection

A NOTABLE and far-reaching step in the reorganization of the American Bureau of Shipping, New York, was outlined by Stevenson Taylor, president of the Bureau, at the annual banquet of the Society of Naval Architects and Marine Engineers, at the Waldorf-Astoria hotel, Nov. 17, when he announced that the Great Lakes Register, which is affiliated with the Bureau Veritas for the survey and classification of vessels built on the Great Lakes for lake or ocean service, will henceforth be known as the Great Lakes Department of the American Bureau of Shipping, and furthermore, that an agreement had been entered into by the American Bureau of Shipping and the British Corporation for the survey and registry of shipping whereby these two societies will hereafter represent the same interests in their respective countries.

Mr. Taylor described the new developments in the American Bureau of Shipping as follows:

"Thanks to the efforts of Judge Harvey D. Goulder and the interested patriotic vessel owners of the Great Lakes, the Great Lakes Register, well and favorably known for its work on the Great Lakes, has joined the American Bureau of Shipping and will hereafter be known as the Great Lakes Department of the Bureau, with Horatio N. Herriman the manager, and his corps of surveyors and assistants just as they have been, serving faithfully in the future as they have in the past. Hereafter, therefore, the judgment and experience of both corporations will be in unison to make classifications and surveys on the Great Lakes of the best character entitled to the confidence of all concerned in that important service.

"Believing that for trans-oceanic service all matters pertaining to construction should be governed by international regulations, the United States asked for an international conference on the subject of safety of life at sea. Such a conference was called to meet in London in November, 1913. This conference was attended by delegates from nearly every maritime nation in the world, and those appointed by the United States performed royal service in behalf of the cause, assisting materially in determining the convention, which was finally adopted and signed unanimously by the delegates from all nations.

That it failed to be formally approved is another story not necessary for us to discuss at this time. Suffice it to say, the principle for which the conference was called remains the same today as in 1913, namely, that the construction of ships for trans-oceanic service should be so determined that in truth it shall be international.

"The American Bureau of Shipping fully realizes this need. It recognizes the valuable work done by other countries and their classification societies. It is, therefore, a pleasure to announce that in the Great Lakes service the arrangement made years ago between the Great Lakes Register and the admirable Bureau Veritas will be continued and probably extended.

"More, the American Bureau of Shipping determined that in such matters its action should be as near international as it could be made, and that as quickly as possible. For this purpose it sent Chief Surveyor McClelland abroad and there has been received cable advices that the American Bureau is at agreement with the British Corporation for the survey and registry of shipping, an agreement which gives the Bureau the full advantage of the practical experience and technical knowledge of that most progressive society, which during its 26 years has been recognized as leading the development of ship building.

"The new rules of the Bureau will be based on the revised rules of the Corporation, and they will embody the most modern systems of building, with such scientific, accurate methods and such flexibility of application as will make them peculiarly adaptable to American ideals.

"The joint arrangement is particularly satisfactory because it ensures harmonious action and an interchange of ideas advantageous to owners and builders on both sides of the Atlantic without interfering with the independence and national character of either society.

"The arrangement immediately removes all difficulties in regard to international load lines for American classed ships, and will be of great advantage in helping our legislation when load lines are adopted here, as they must be.

"The Bureau will act for the corporation in America and vice versa. The classifications will be in effect interchangeable. Dual classifications will be obtainable at a little more

than cost of single classification. Surely, development on such lines will be real international classification in its best form. Owners will now fully realize that no longer need they feel it to be necessary to have the classification of any particular foreign society to obtain full insurance here or abroad."

Late Marine Patents

Copies of any one of the following patents can be obtained by sending 15 cents in stamps to Siggers & Siggers, patent lawyers, National Union building, Washington, D. C., by mentioning *The Marine Review*:

1,200,616—Life-saving device. Robert Walter Hudson and Henry Bush Spencer, Ottawa, Ont., Can., assignors of one-fourth to Rupert William Nichols, Ottawa, Ont., Can., and one-fourth to Albert Edmund Hudson, Calgary, Alta., Can.

1,200,765—Deck of ship, so as to render it applicable for use as a life-saving raft. Tom Hildred Scrimshaw, Leeds, England.

1,200,858—Pillow for use on ships, boats, and other craft. Hyman Linder, Whitechapel, London, England.

1,200,933—Life-saving and swimming belt. Isaac Fraki and Wilhelm August Merila, Hancock, Mich.

1,200,960—Power propelled boat. Charles J. McHugh, Indianapolis, Ind., assignor to the H-K Toy & Novelty Co., Indianapolis.

1,200,986—Boat-launching device for ships. Charles A. Richter, Grand Haven, Mich., assignor of one-half to Duncan A. McDonald, Grand Haven, Mich.

1,200,997—Propelling apparatus for vessels. Lawrence York Spear, Groton, Conn., assignor to Electric Boat Co., New York.

1,201,051—Submersible storage tank. Charles Peter Mitchell Jack, Brooklyn, N. Y.

1,201,098—Internal-combustion engine. Arthur Harry Roper Pulman, London, England, assignor of two-thirds to Oliver Prescott Maciarlane, London, England.

1,201,163—Internal-combustion engine. Charles R. Edwards, Pekin, Ill.

1,201,165—One-man hand-propelled boat. Karl E. Fischer, Brooklyn, N. Y.

1,201,176—Means for destroying vessels. Frederick V. Hagan, San Francisco, Cal., assignor of one-third to Weller Robinson, Nampa, Ida.

Pacific Mail Flag

The United States bureau of navigation announces the registration, pursuant to section 7 of the act of May 28, 1908, of the following-described house flag and funnel marks of the Pacific Mail Steamship Co., San Francisco: House flag, a swallow-tailed flag, divided longitudinally into five stripes, the top and bottom stripes being red, the two adjacent stripes white, and the middle stripe blue; funnel marks, a yellow funnel, with a black band at top and an adjacent white band.

Invest \$85,000,000 in Marine Firms

Private Capitalists Have Contributed Huge Sums to Upbuild Our Merchant Marine—New Conditions Shown by Expansion at New York

PRIVATE capital to the amount of \$85,125,000 has been invested in American shipping companies since the war started. While this investment was of course the result of the demand for shipping, growing out of the present worldwide shortage of tonnage, it also provided the financial sinews by which this demand could be met. American investors, shy for years of investing in shipping securities, opened up their purses when wartime conditions temporarily removed the legislative strictures that have retarded the growth of an American merchant marine.

This response of capital has kept pace with the developments in the market for tonnage. In the early months of the war few new companies were organized, but since that time there has been a steady increase. and August of this year showed the third largest total of new capital invested of any month since the war started. The following table, compiled by *The Journal of Commerce* New York, shows the total capital authorized in the incorporation of new shipping companies by months since the beginning of the war up to Sept. 1. The list includes concerns of more than \$50,000 capital organized for the operation, construction, salvage and repair of ships, and also new financing involved in the expansion of existing companies:

1916—		1916—	
January	\$ 4,850,000	May	\$ 2,725,000
February	5,525,000	June	5,780,000
March	12,155,000	July	1,425,000
April	4,234,000	August	8,925,000
Total		\$45,619,000	
1915—		1915—	
January	\$ 1,975,000	July	\$10,450,000
February	803,000	August	4,530,000
March	825,000	September	2,919,000
April	1,485,000	October	2,005,000
May	4,845,000	November	5,900,000
June	350,000	December	1,575,000
Total		\$37,662,000	
1914—		1914—	
August	\$ 1,125,000	November	\$ 100,000
September	519,000	December	100,000
Total		\$ 1,844,000	
Total since opening of war		\$85,125,000	

The names of new steamship concerns, formed to build, operate, lease vessels or construct piers and terminals, etc., are given below for the month of August. The list includes only companies of more than \$50,000 capital. The largest corporations are the Rio de Janeiro Transportation & Navigation & Public Service Co., New York, \$5,000,000; the American Ship Co., Maine, \$1,000,000, and the Sub-

marine Navigation Co., Delaware, \$2,000,000. The figures in detail as to capital are as follows:

Brunswick Shipbuilding & Dry Dock Co., Delaware	\$ 100,000
The New York & Boston Transportation Co., New York	100,000
North American Line Co., New York	50,000
Illinois & Louisiana Transportation Co., operate steamboats, Illinois	125,000
Rio de Janeiro Transportation, Navigation & Public Service Co., N. Y.	5,000,000
American Ship Co., Maine	1,000,000
Virginia-Carolina Navigation Co., N. Y.	50,000
Coastwise Shipping & Lighterage Co. of Delaware	100,000
Liggett Shipping Corp., New York	100,000
Loft Shipping Corp., New York	100,000
Seward Navigation Corp., New York	200,000
The Submarine Navigation Co., manufacturing and operating, Delaware	2,000,000
Total	\$8,925,000

New York as an Example

New York in its position as the country's leading port and handling as it does more than half of the total exports and imports of the United States, has witnessed an expansion in its shipping industry closely matching that of the entire country. Many of the new industries incorporated in recent months are located in New York, while existing companies have generally increased their facilities. Previous to August, 1914, the bulk of New York's trade was inward. Now this position is reversed and the export business constitutes the heavier movement. During the last fiscal year, New York's share in the nation's trade amounted to \$3,529,060,617, or about 54 per cent, as compared with \$2,125,421,097 in the fiscal year ended June, 1915, and \$1,806,525,366 in the calendar year 1914. During the larger part of the last fiscal year the increase has been attributable to a gain in exports, although more recently imports also have been on the rise.

The Hamburg-American, the North German Lloyd and Austrian services have been suspended during the war and many British services have been curtailed because of the demands made upon the British merchant marine by the admiralty. To take the place of these services, a large number of new lines have been started at New York, most of them within the last year. In addition to this, there are numerous individual owners and charterers who offer boats for different ports at irregular intervals. The following are some of the lines that have been established at New York and changes in old services:

The Cunard line has for the time being discontinued its sailings to the

Mediterranean. Also as previously reported, Gans Steamship Co. has suspended its service to Rotterdam.

Vessels of the Barber line now call at Bordeaux and La Pallice. This company has also instituted a service to Australia and New Zealand via the Panama canal.

The Norwegian American line has increased its service to weekly sailings.

The number of sailings for French ports has been greatly increased. Among the new lines are the Kerr Steamship Co., whose ships run to Bordeaux, Havre and Marseilles; the Oriental Navigation Co., with frequent sailings to Havre and Bordeaux; the Plantade line to Bordeaux, and a direct steamer service for which Norton, Lilly & Co. are agents.

The Kerr Steamship Co. also operates a service to Barcelona, and has recently been appointed as agents for the Wilhelmsen line, which is owned by a leading Norwegian concern and will run between New York and Brazilian ports. The Royal Belgian Lloyd line, just organized, has announced a New York-Havre service.

The Russian Transport line is among the new enterprises handled by Funch, Edye & Co., operating between New York and Archangel when this service is permitted. The Russian-American line sends its ships to Archangel direct now, rather than to Rotterdam and Libau as before the war.

The Ocean Transportation Corporation has scheduled ships for Cadiz, Barcelona and other Spanish ports and the Canary islands. The Globe line, organized within the last year, has sailings scheduled for Lisbon, Bordeaux, Guayaquil and Archangel, Interchange, Ltd., has a ship scheduled for Genoa and Naples and one for Gothenburg.

Two new services to China and Japan via the Panama canal have been inaugurated by the Nippon Yusen Kaisha and the Lukenbach company.

The American Smelters' Steamship Co. has been organized and has started a service to Chilean ports. W. R. Grace & Co. have announced that a passenger and freight service will be operated to the west coast of South America beginning next May. Moore & McCormack also run a service to South American ports.

In the Traffic Manager's Office

A Review of the Month on Coasts and Lakes—Useful Pointers
for the Men Who Get the Business

World is Looking to U. S. Ship Yards

PRINCIPALLY because of a difficult labor situation and shortage of materials, the present advantage in ship building lies with the United States. At the Clyde ship yards labor has the upper hand. Mercantile building is at a disadvantage because the men prefer government work, which pays them better. The work of all the British yards is behind. European yards in general suffer from steel shortage. This applies also to the Japanese builders.

As to the Clyde situation, it is not the amount of work on hand, nor its relation to previous months or years, but the almost total cessation of mercantile launchings, and the complete lack of reports of new work that appears serious. It is obvious to all who are acquainted with the river that very few vessels are being floated for cargo-carrying purposes.

Some of the Clyde ship builders have tried to divert labor from government to mercantile work—with the approval of the authorities, of course—and have found the process very difficult. The men prefer the work represented by the smaller vessels on which they are employed, as, in addition to being lighter, it pays them better than the construction of cargo steamers. The piecework rates make larger aggregates for corresponding periods.

Face Three Courses

The ship builders to whom reference has been made were faced with a choice of three courses. First, they could leave the men on government work and allow the mercantile to stand; second, they could transfer the men to mercantile work at the higher wages, which would tempt them to agree to the transfer; or third, they might insist on the transfer at current merchant work rates and take the risk of having the men applying to a munitions tribunal for their leaving certificates on the ground that they were not engaged on work of national importance, and wished to go to another establishment, under easier conditions.

As they cannot afford to lose any men, a firm thus situated usually compromises the matter by paying the higher rates, frequently on contracts which have not been specified by the authorities as war work. On these latter the higher rates rule as a matter of course. Altogether, the general result is that, while the bulk of the merchant work is held up, that which is making progress is costing a great deal more than was anticipated when the contracts were placed.

The serious shortage of British mercantile tonnage, which is placed at over 4,000,000 tons by the *Liverpool Journal of Commerce* has aroused parliamentary and shipping circles. The estimate is not based alone on vessels destroyed at sea by submarines or other war methods, but on the "set-back" so-called, which has been due to lack of facilities for building new ships, as well as to the war causes. The estimate of *The Journal of Commerce* follows:

	Gross tons.
Hindrance of new construction.....	1,700,000
War losses	1,520,000
Excessive depreciation	1,000,000
Total	4,220,000

According to Lloyds ship building returns, British vessels completed during the third quarter amount to only 71,000 gross tons. The total for the present year to the same date is 200,000 gross tons, which compares with a normal output of 1,000,000 tons for the same period. These figures apply right up to a few weeks ago, and therefore there is little justification for optimism. On the other hand future competitors are developing their powers of tonnage production at a very rapid rate, and they will be able to compete with England for the supply of the world's requirements on a much better basis than in pre-war times.

Although there is difficulty in placing orders for plates and other materials in the United States and prices have advanced several hundred per cent over pre-war levels, conditions are much more favorable to the output of tonnage than abroad. The

labor question is causing considerable difficulty here, particularly the shortage of skilled workmen and the steady upward trend of wages, but the situation in this respect does not differ widely from that which exists abroad, with the exception of Japan, and even in that country there has been an increase in wages.

We Have the Steel

The United States is the only country which is not dependent upon foreign sources for ship building materials or is not forced to use the available supplies of these materials for naval construction. In Great Britain the work for the admiralty and for other war purposes is exhausting the capacity, with the consequence that merchant construction is greatly hampered, and inquiries have been made in the American market for steel for British ship building. Japan also has purchased heavily here, but has been unable to obtain all that was wanted. The continental countries of Europe import a considerable proportion of their ship building materials from Germany and this trade has, of course, been stopped.

Just what conditions prevail in Germany is uncertain, although such reports as have come from that country indicate a sub-normal activity in the ship yards there.

A recent article concerning the effects of the German export prohibitions upon the ship building industry of Norway showed that Norwegian ship building was seriously restricted. The same situation prevails in Denmark. A committee of representative importers and consumers has recently been formed in Copenhagen to study the problem and to take the steps necessary to secure the required supplies. In both these countries a general stoppage of labor, owing to absence of materials, is threatened.

The Dutch ship building industry appears to be on the eve of a crisis owing to the lack of certain materials, including steel and coal, which were

formerly imported from Germany. The Netherlands Ship Building Co. has recently announced that it has been forced to discharge workmen, and other yards are likely to follow, although all are overloaded with contracts.

German Output Low

There has recently been a noticeable decline in the production of many of the German iron works which manufactured ship building steel and iron, and lately the German government has imposed severe restrictions on the export of such goods, amounting in some cases to absolute prohibition. This decline, according to statements in the Dutch press is due on the one hand to the fact that the iron works have been doing a large amount of work in the manufacture of munitions, while on the other hand there has been a considerable scarcity of labor. As a consequence the Dutch ship building yards have of late been receiving practically no steel for plates and frames, and the position is such that unless the situation promptly changes, many of the works in question will have to discharge a large number of their hands.

In a word, ship building the world over must look to the United States for help.

Fast Service

The Toyo Kisen Kaisha, the principal Japanese shipping company in the trans-pacific trade, announces, according to Consul General George E. Anderson, Hongkong, China, that it is building a new vessel, *SAN FRANCISCO MARU*, which will be the largest and fastest vessel on the Pacific ocean. It also states that this vessel will serve only in an express service between Yokohama and San Francisco by way of Honolulu, and will make connections at Yokohama with other vessels serving Manila and Hongkong.

This division of the voyage has been discussed by shipping interests from time to time and was seriously considered a little less than a year ago, when the reduced tonnage on the Pacific made it impossible to serve the entire east acceptably, with the result that Japanese ports and interests were first served by Japanese lines. It was estimated at that time that by confining the service of the larger and faster ships to the Yokohama-San Francisco run, and allowing the service between Hongkong and Yokohama to be taken over by other lines and smaller ships, the available tonnage across the Pacific could be materially increased.

The new vessel is to have a length of 636 feet, about 46 feet longer than the "Empress" ships of the Canadian

Pacific Ocean Service, Ltd., which now furnish the leading fast service across the Pacific. The ship will have quadruple-expansion engines, a speed of 23 knots an hour, accommodations for 300 first-class passengers, 100 second-class, and 800 steerage passengers, and every possible convenience and luxury. It will, in short, be designed to compete with the Canadian Pacific and with any ships American companies may elect to place in the Pacific service. It is expected to be ready for use within two years. Much of the material comes from the United States. Its construction is under way in a new ship yard established for the purpose. It will be followed by other ships of the "Empress" class.

Japs Served First

The inauguration of the express system from Yokohama to San Francisco emphasizes the policy of the Japanese lines, under government subsidy, to serve Japanese interests first, leaving Manila and Hongkong interests and American trade there to be taken care of by other means.

The fast service will be of special advantage to Japanese silk interests, since the short voyage reduces interest

charges on valuable silk cargoes to a minimum. This is one of the vital elements in the silk-import business. Inasmuch as Japanese silk interests in the past few years have developed almost a complete monopoly of the raw-silk trade with the United States, this first service is likely to increase materially the hold of the Japanese silk dealers upon American manufacturing interests.

Manila Out in the Cold

It is becoming more and more evident that if there is to be any material improvement in the shipping services between the United States, Hongkong and Manila it must be from American sources. The inauguration of the new service of the Pacific Mail Co. is being watched with great interest. The vessels now in service are said to be comfortable, attractive, and satisfactory in every way, except in size and speed.

The keenest sort of competition in passenger and freight service on the Pacific is expected at the close of the war, and the character of the vessels already in service or under construction is such that only those of the highest class may hope to have a reasonable part in the trade.

Great Lakes Ore Rate \$1

MAINLY because of the high and increasing cost of labor and coal, the ore carrying rate from ports at the head of Lake Superior for 1917 has been fixed at \$1, net. This is the highest rate since 1900, when the contract rate was \$1.25; the wild rate for that year averaged about 84½ cents.

The dollar freight rate for the Great Lakes is exactly double the rate for 1916. It is equivalent to \$1.10, gross. The gross rates for other years since 1900 have been as follows: 1901, 84 cents; 1902, 76 cents; 1903, 83 cents; 1904, 70 cents; 1905, 76 cents; 1906, 75 cents; 1907, 75 cents; 1908, 65 cents; 1909, 65 cents; 1910, 70 cents; 1911, 60 cents; 1912, 50 cents; 1913, 55 cents; 1914, 50 cents; 1915, 50 cents.

Earlier in the season it was thought that an increase of 25 or 35 cents would be made; but it has been for some time generally recognized that the rate would be doubled. The action of a number of the leading shippers in making contracts for the 1917 season at \$1 has therefore caused no great surprise.

It is expected that the contracts which have just been made will govern a large percentage of the business to be done, although some owners of vessels have indicated that they will hold a large part of their tonnage in

reserve, in the hope that they may be able to place it at a wild rate higher than the rate now fixed. But most of the vessel tonnage has been already contracted for for the season.

The increase in the general cost of operating ore carrying steamers on the Great Lakes, the vessel owners say, entirely justifies the new rate. The cost not only of labor, but of coal and of other supplies, they assert, has made necessary the sharp advance quoted.

The iron ore selling movement for 1917 delivery was delayed while the shippers awaited the fixing of the rate. Ore selling is now on at full blast at prices averaging \$1.50 higher than during the past season.

The New York Ship Building Co., Camden, N. J., has now under way five steamers for the Darrow-Mann Co., one for the Gulf Refining Co., one for the Coastwise Transportation Co., a coal carrying steamer for the Pocahontas Navigation Co., an 11,000-ton oil steamer for the Petroleum Transport Co., a lumber carrying steamer for the Carpenter O'Brien Co., and eight car floats for the New York, New Haven & Hartford railroad. The total work contracted for and yet in the yard of the ship building company amounts to more than \$10,000,000.

Passenger Rates Boosted

IMPORTANT changes in the course of transpacific passenger traffic which were impending some time before the war have been inaugurated in an increase, effective recently, in passenger fares for first-cabin passengers on the vessels of the principal lines. The chief change is the rise in the cost of first-class passage from Hongkong to San Francisco, Vancouver or Seattle from \$225—or rather the pound-sterling equivalent of \$225 American gold—to \$250 American gold, the American currency hereafter to be the basis of all transpacific rates, thus abandoning a long-established custom of the trade so far as rates eastward are concerned.

San Francisco and Honolulu, which were even larger in proportion, and for the same reason.

Under the new schedule of rates the fare to and from Yokohama remains at the present rate, the increase in direct fare applying only to the more distant ports. However, all fares are raised in a way, for the agreement between the steamship companies now effectively abolishes all special rates except a one-year round-trip rate. Special rates included percentage reduction of fares for missionaries and officers of various governments resident in the far east passing to and from their posts and also a 6-month

EAGLE and by the Toyo Kisen Kaisha on NIPPON MARU and PERSIA MARU. While no definite announcement has been made it is understood in shipping circles that the rates on other lines, such as the Blue Funnel, the Java-China, and the Osaka Shosen Kaisha, will be advanced proportionately.

Canadian Tonnages Low

Not since the phenomenally dull period of 1896 and 1897 has the volume of tonnage built in Canada been so low as that turned out during the last fiscal year, when only 13,497 tons were built. The lowest figure on record is that representing the output of 1896, which was 10,753, and in the following year it was 12,058. Next in

Plenty of Business Ahead for Five Years

According to a review of shipping conditions prepared by shipping experts and submitted to the American International Corporation before its purchase of the New York Shipbuilding Co., at the outbreak of the war the world's tonnage of merchant ships over 100 gross tons capacity was 49,000,000 tons. The average annual increase necessary to keep pace with the increased need of bottoms has been just a trifle short of 2,000,000 tons. At the normal rate of growth the world's tonnage January 1, 1917, ought to be 53,000,000 tons. But the first of January will not see a world tonnage of 53,000,000, nor of even 49,000,000. The figure will be nearer 48,000,000.

The attention of the public has been drawn to the destruction of ships by submarines. This loss has amounted to 2,800,000 tons, but according to the bureau of naviga-

tion, the loss due to the interrupted ship building caused by overcrowded yards doing repair work is even greater than this figure, and equals 3,200,000 tons. Leaving submarine losses out of the question, the new ships launched have not been enough even to replace those scrapped on account of old age and those lost through natural causes.

Although the great demand for tonnage has stimulated ship building in the United States, foreign output in neutral countries has been slow, due to small capacity and lack of materials, and in belligerent countries the dropping off in production has been serious. It is estimated that the tonnage of the world cannot be brought back to its normal position with regard to world requirements, until 1922 at the earliest. This estimate is predicated on the war coming to an end in 1918 and upon the ship building

capacity of the world being largely increased to meet the emergency.

There is doubt that the building capacity of the world as applied to merchant tonnage, can be increased at will to meet this emergency, according to the report. There are too many hindering elements, effective, particularly in European ship yards. England's merchant fleet amounts to 40 per cent of the tonnage of the world. One half of that is in government service. The ships of this fleet have been worked relentlessly, and, as a rule have never gone into dock for repairs except when actually disabled. This means that at the end of the war 20 per cent of the world's tonnage will be in bad condition, and that British yards will be given over almost entirely to repair work for a considerable period. The same holds true of French and Italian ships and ship yards.

In transpacific rates for passengers there are two divisions, that from San Francisco, Vancouver or Seattle to Yokohama and that from such American ports to Hongkong, Shanghai and Manila. Heretofore the rate from Yokohama to the American ports has been the equivalent of \$200 American gold, while the rate from Hongkong, Manila and Shanghai has been the equivalent of \$225 American gold. This difference is really out of proportion to the comparative length of the voyage to the several ports, but the steamer companies have reasoned that a passenger to or from Yokohama used cabin accommodations which would otherwise be available for the longer voyages with the larger fare and should therefore pay more in proportion. The same reasoning has applied to fares between

round-trip rate, all of which were abolished. The passenger agreement on which the rates noted are based is effective between the Canadian Pacific Ocean Services, Ltd., the Toyo Kisen Kaisha and the Pacific Mail Steamship Co. There is some question as yet as to the course to be followed by other lines, notably the Nippon Yusen Kaisha with its service to Seattle. It is understood that this company will adopt rates showing a similar increase, though its charges will remain lower than the standard fares noted, and its course will continue to be independent of the conference lines. The China Mail Steamship Co. will maintain present rates. The three companies in the agreement issue interchangeable tickets. Intermediate service at lower rates is furnished by the Canadian Pacific line on EMPRESS OF JAPAN and MONT-

order comes 1916, when 13,497 tons were built. It would appear superfluous to add that at no time has the country been in greater need of tonnage not only for lake but ocean purposes. The steady decline of the ship building industry may be gathered from the following comparisons of tonnage built and registered in Canada:

Fiscal year.	Tonnage built.	Tonnage registered.
1875.....	188,008	204,002
1880.....	68,756	64,982
1890.....	39,434	53,853
1900.....	28,544	40,443
1910.....	24,059	33,383
1915.....	45,721	55,384
1916.....	13,497	102,239

On the other hand, the tonnage calling at Canadian ports has steadily increased except for the two years since the outbreak of the war.

Late Decisions in Maritime Law

Legal Tips For Ship Owners and Officers

Specially Compiled for The Marine Review

By Harry Bowne Skillman

Attorney at Law

THE case of BENJAMIN NOBLE, 232 Federal Reporter 382, after holding that a steamer built for carrying wood pulp, draft of 14½ feet, which carried a cargo of steel rails and was loaded to a depth of 18 feet, having a freeboard of not more than 2 inches, was overloaded, decided that the fact that the captain of the vessel for the voyage had never before served in that capacity is not of itself sufficient to charge the owner with negligence which will debar him from the right to limit his liability; that in determining safe loading as to weight of cargo, the guiding thing should be the vessel's draft; that the ship owner was not relieved from responsibility for overloading by the fact that other owners habitually do the same thing; that a corporation ship owner is responsible for the acts of its managing agent done in his capacity as such agent.

* * *

Provision of charter party that in case of dispute it shall be settled by two referees, one to be appointed by the captain and one by the charterer, with power in the two to select an umpire, if necessary, was meant, it was decided in *Aktieselskabet Korn-Og Foderstof Kompagniet v. Rederiakstiebolaget Atlanten*, 232 Federal Reporter 403 to apply only to disputes which might arise during performance of the charter, and has no application where, before the charter was entered upon, the owner deliberately and without excuse repudiated the charter and refused to deliver the vessel. It was further held that a clause in the charter party providing, "Penalty for non-performance of this agreement to be proven damages, not exceeding estimated amount of freight," cannot be construed to limit recovery of charterer from owner for an entire repudiation of the charter.

* * *

Under the United States statutes giving a lien on a vessel for supplies furnished to it, it was held in *YANKEE*, 233 Federal Reporter 919, that supplies furnished on orders of a dredging company, which specified that they were for a certain dredge and contained shipping directions pursuant to which the supplies were forwarded by carriers to a certain wharf, from which they were

taken by the company to the dredge where it was at work, constituted a lien attached to the dredge. In the case of *OCEANA*, 233 Federal Reporter 139, the court decided that one furnishing supplies on order of any person to whom the management of the vessel has been intrusted by the owner is under no duty to inquire as to the authority of such person to bind the vessel, and is entitled to a lien, unless something comes to his knowledge to put him on inquiry, in which case his right to a lien is affected by such facts as he knows or by the exercise of reasonable diligence could have ascertained.

* * *

Seamen deserting from foreign vessels cannot be arrested, imprisoned, and delivered to the master of the vessel, except when the matter is controlled by treaty or convention with foreign governments; Virginia Code of 1904, sections 2004, 2005, providing for arrest of deserters, it was decided in *ex parte Larsen*, 233 Federal Reporter 708, does not apply to foreign vessels.

* * *

Though the United States statutes provide that for each deposition taken and admitted in evidence in a cause a fee of \$2.50 shall be allowed libellant's proctor, such proctor, the court decided in the case of *MARY*, 233 Federal Reporter 121, is not entitled to fees for depositions of a witness whose testimony was immaterial.

* * *

In *WYOMISSING*, 232 Federal Reporter 453, it was held that companies engaged in transporting long and unwieldy tows in tidewaters, between New York and New Jersey, and desiring dredges engaged in government work to move themselves or their scows, should send a timely request to the dredge, and in absence of such request the dredge is not liable for collision resulting.

* * *

A stevedore, injured during course of his employment in loading a cargo by the slipping of a winch, the apparatus being furnished by the ship, may be guilty of contributory negligence in remaining at work with knowledge that such winch was defective and dangerous, although he protected himself to the best of his ability at the time of the

accident.—*WILHELMINA*, 232 Federal Reporter 430.

* * *

The United States Supreme Court holds, in the case of *Pacific Mail Steamship Co. v. Ed. Schmidt*, 36 Supreme Court Reporter 581, that the penalty imposed by the federal statutes upon a ship owner, who without sufficient cause neglects or refuses to pay a seaman's wages after certain periods, is not incurred during delay caused by an attempt to secure a revision in a federal court by appeal from decree for wages and penalty for delay.

* * *

The East river is not a narrow channel within Article 25 of the Inland Rules, it was said in *WRESTLER*, 232 Federal Reporter 448, and the only regulation as to navigation between the Battery and Blackwells Island is section 757, chapter 410, Laws of 1882, New York, which requires vessels to go up and down as near as possible in the center of the stream.

* * *

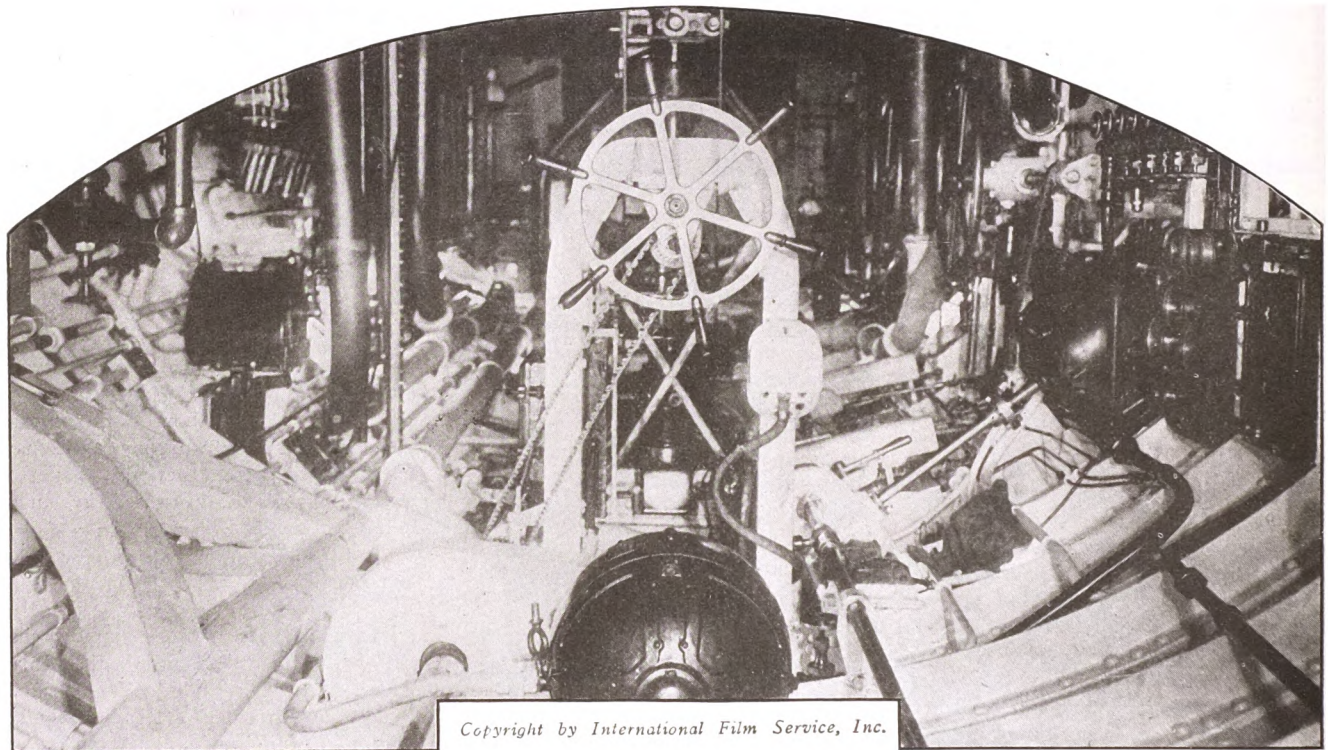
It was held in *DRILL BOAT No. 4*, 233 Federal Reporter 589, that it is the duty of the crew of a vessel which sinks in a harbor channel to use reasonable care and diligence to protect it against damages from collision with other vessels, and in connection therewith to warn other vessels against colliding with it. The duty, imposed by statute, to immediately mark the position of the sunken vessel is a personal duty of the owner, which cannot be delegated, so as to relieve him from responsibility.

* * *

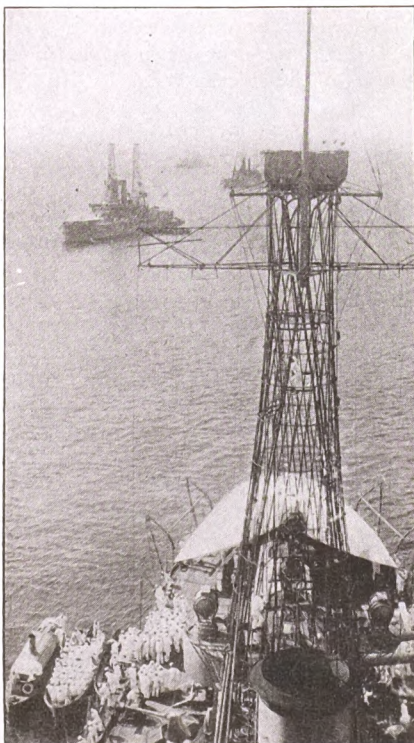
A tug and tow, of common ownership, and engaged upon a voyage, the sole purpose of which is to transport the cargo laden on the tow, do not constitute a "single vessel", within the Harter Act, and the tug cannot be considered as transporting the cargo, so as to be exempted from liability to the cargo owner for loss resulting from faults or errors in navigation, if due diligence has been used to make the barge seaworthy and properly manned, equipped, and supplied, especially where the tug and barge are operating under separate contracts, bill of lading having been made by the barge.—*Coastwise*, 233 Federal Reporter 1.

Photographs From Far and Near

Contributions For These Pages Are Solicited



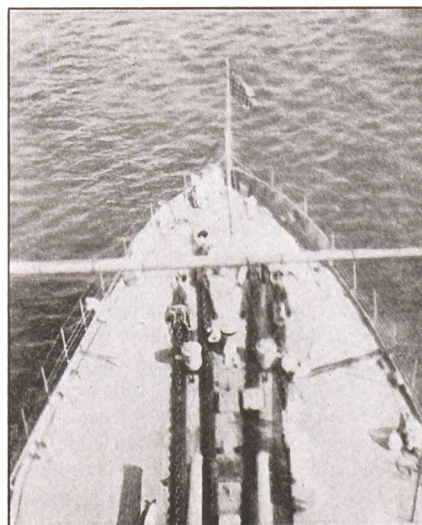
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FROM THE SPOTTER'S STATION

The above illustration is reproduced from a photograph taken from the armored spotter's cage on the fore mast. High above the decks, the spotters calculate the ranges for the gun fire from the turrets. A steady hand and stout heart are necessary to even mount to the perilous position. With the north Atlantic rollers tossing the battleships like a cork, the journey up, or down, with safety, is no simple feat.

THE WASP AND THE DRAGON
The above illustration is an interior view of one of Uncle Sam's newest submarines, and below, the bow from the foremast of one of the navy's biggest battleships. The contrast between the two brings to mind the story of old David and Goliath, for the deadly sting of the torpedo brings to naught the might and immensity of the most powerful dreadnaught. The present war abroad has brought home as never before the vital necessity of a powerful undersea fleet, and the recent activity of congress in authorizing the building of a large number of this type of craft is commendable. In the foreground of the above illustration may be seen the motor which drives the gyroscopic stabilizers, while the wheel and periscope tubes are shown in the back ground.

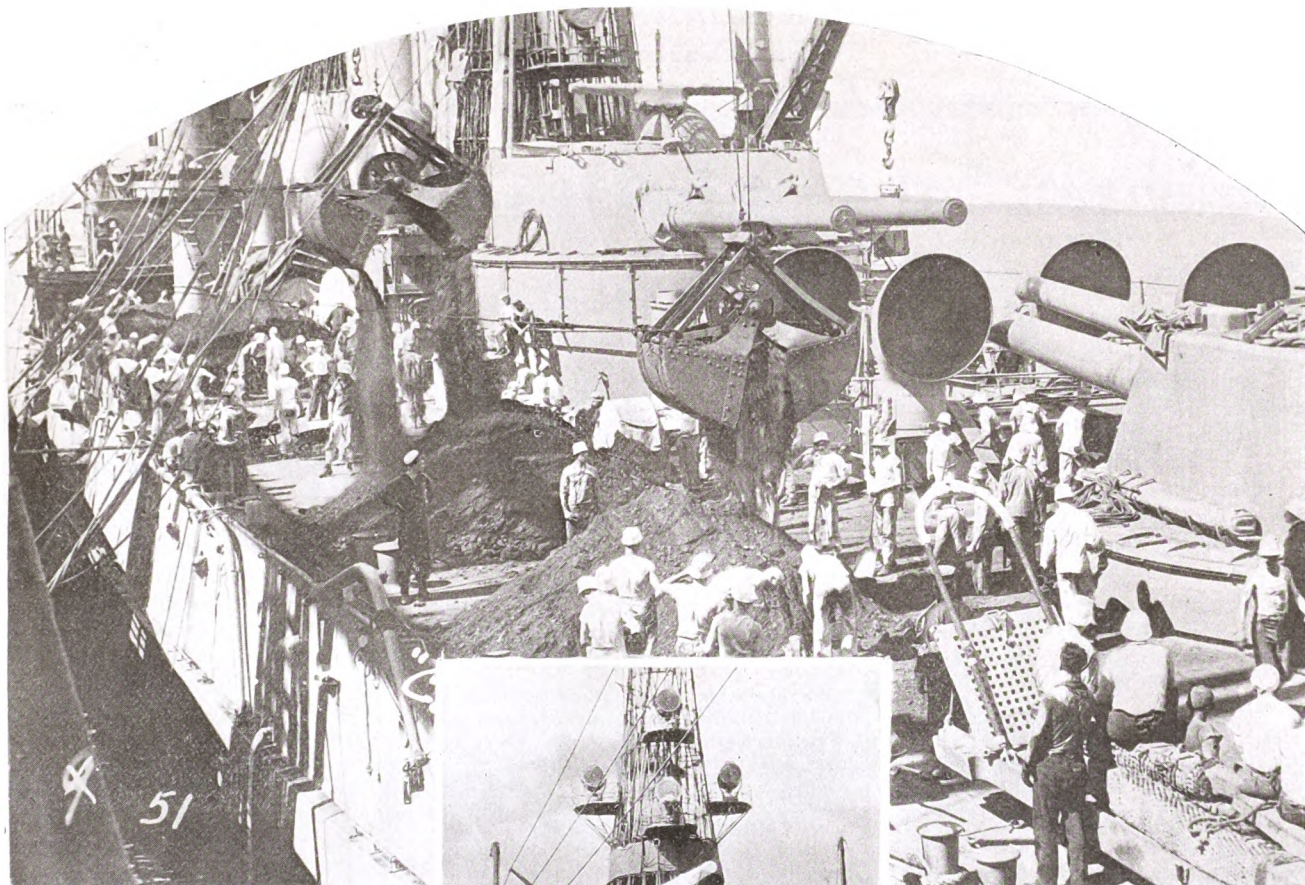


IN THE SHADOW OF BIG BEN

After the dirty work of coaling comes the clean up, hose lines are coupled and the decks washed down and holystoned. As soon as the last bucketfull of coal has been dumped on the deck and the wheelbarrows have made their last trips to the coal chutes the men all turn to for the tidying up of ship and the big fighters gotten under way immediately. The accompanying illustration shows the fleet steaming to sea.

Latest Marine News in Pictures

Payment Will Be Made For Acceptable Photographs

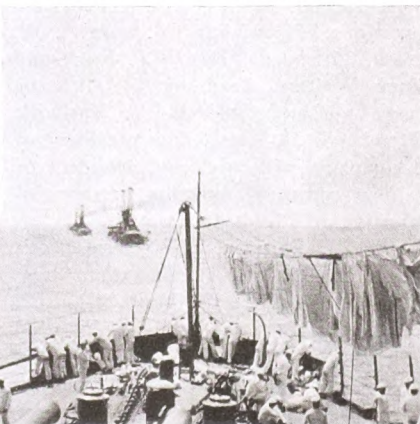
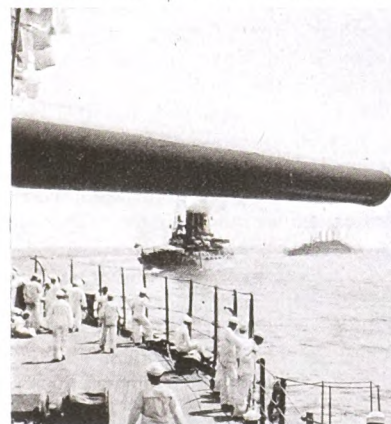


THE BUGLE CALL "COAL SHIP"

The accompanying illustration shows the battleship TEXAS coaling during her recent maneuvers. The protective belt of armor makes it impossible to provide coaling hatches in the side of the ship, hence the dirty job. The coal is swung aboard by grab buckets and dumped on the deck. The crew, detailed into three or more shifts, don dungarees and sweat shirts, man the wheelbarrows and make the

MEANS HARD AND DIRTY WORK

best of an unpleasant job. Those who have advocated the adoption of oil burners on recent battleships have pointed with disgust to the time-wasting procedure of coaling ship and they have been justified in this opinion. It is a slow and arduous task and there must be rejoicing among the "boys" who are to man the new dreadnaught PENNSYLVANIA and her sister ships. They are all equipped to burn oil.



SINGLE FILE! FOLLOW FLAGSHIP!

Close on the heels of U. S. S. LOUISIANA come three units of the battle fleet, RHODE ISLAND, VIRGINIA and NEW JERSEY. The accompanying illustrations are reproduced from photographs taken during the civilian training cruise. A skeleton crew of trained jackies was retained by each ship on the cruise while the civilians learned the game.

THE WATCH BELOW

When the holystoning's done the hour of lounging on the forecandle is welcome. The civilian cruise proved to the erstwhile private citizen that Uncle Sam is an exacting master, yet he provides recreation after the work is done. The "jack" in the foreground no doubt is being told that each of the huge links in the anchor chain weighs nearly 70 pounds.

WASH DAY ON THE LOUISIANA

No valet accompanied Mr. Citizen while the latter learned the war game. He washed his own clothes and hung them for'd to dry. In the accompanying illustration part of the reserve fleet is shown under full steam heading out to sea, to take part in the maneuvers, which embraced nearly every phase of life in the navy.

American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the
Vessel Construction Field

American International in Camden Yard

ONE of the most important transactions so far handled by the recently organized American International Corporation, New York, has been completed with the purchase, in November, of all of the properties of the New York Shipbuilding Co., Camden, N. J. Associated with the American International in the deal are the International Mercantile Marine Co., which is expected to build several new vessels for the American line at the plant; the Pacific Mail Steamship Co., which is owned jointly by the American International and W. R. Grace & Co., and W. R. Grace & Co. The American International has the largest interest.

The New York Shipbuilding Co. is 17 years old, and owns a large modern plant at Camden, N. J., with 111 acres of land and 4,200 feet of waterfront on the Delaware river. The company has \$6,000,000 of stock outstanding but the purchase price was \$15,000,000, it is said by Charles A. Stone, president of the American International. The company will be liquidated and a new one formed, and it is expected that part of the new stock will be offered for public subscription.

The former principal owners of the New York Shipbuilding Co. were A. W. Mellon, Pittsburgh; Henry C. Frick and Henry Walters, head of the Atlantic Coast Line and Louisville & Nashville railroad. S. M. Knox, now president of the company, will be elected president of the new company, and the present organization will be kept intact.

George J. Baldwin, senior vice president of the American International and president of the Pacific Mail Steamship Co., has explained the reasons which led to the purchase. He said that in the first place it was in line with the policy of the corporation to do all in its power to develop American industries and encourage foreign commerce and in the second it promised to be a very profitable undertaking. The company has contracts which will fill the present capacity of the yards through 1917, and improvements and extensions are planned which will materially increase the capacity of the yards. Mr. Baldwin said that there

was in view all of the work that American yards could handle in the next five years.

It was said that conditions which brought about the decline in the ship building industry in the United States, which led the world in the days of the wooden vessels, have now changed to

One Inquiry a Week

In commenting upon the purchase of the New York Shipbuilding Co., Mr. Baldwin said that American shipbuilding is now entering upon a new era, in which for the third time in history vessels can be built in the United States more cheaply than abroad. The first, he stated, was when wooden vessels predominated. This supremacy passed away when iron and steel ships were introduced at a time when British industry was more strongly organized and this country was still an agricultural nation. The second period came when shipping on the Great Lakes developed and it was found that steamers could be constructed for this purpose more cheaply in American yards, especially as ships could not be brought into the Great Lakes from foreign nations.

"Proportionately the cost of constructing ships here is now less than it has been before," said Mr. Baldwin. "I believe this situation will continue indefinitely and it will certainly exist for at least five years, until the present deficiency in the world's tonnage can be replaced. One American bank alone has handled \$50,000,000 for Norwegian ship men who have purchased vessels here within the last few months. The New York Shipbuilding Co. has received an average of one inquiry a week for ships from British interests."

such a degree that there is reason to expect the United States to regain its supremacy. American builders have already built vessels on the Great Lakes which are carrying cargoes at lower ton-mile cost than any other vessels in the world, and the war has destroyed Great Britain's advantage over competitors.

The fact is being emphasized that

Norway has spent \$50,000,000 in this country recently for ships, and that Japan has paid \$90 a ton here for steel plates to be carried over the continent and across the Pacific, in order to build vessels at home. Advances in manufacturing methods have largely overcome Great Britain's great advantage in low-priced labor. With steel at hand more modern yards, and better engineering, it is asserted that ships can be built here as cheaply as on the Clyde or Tyne.

Mr. Baldwin explained that there was a great scarcity of ships, due to the destruction of many vessels and the diversion of others for transports, and that it is estimated that by Jan. 1 there would be a shortage of 5,000,000 tons. Great Britain has recently enacted a law which will prevent ships built in her yards from being transferred to foreign flags for three years after the war, and other nations have taken similar action.

The New York Shipbuilding plant has a present capacity of 100,000 tons a year. During the past 10 years the company has turned out such vessels as the armored cruiser WASHINGTON, the battleships KANSAS, NEW HAMPSHIRE, MICHIGAN, ARKANSAS and OKLAHOMA, eight destroyers and a number of battleships for foreign governments. The battleship UTAH is now under construction in the yards.

The plant is equipped for the building of steel vessels, both mercantile and war, and for the construction of various essentials to shipbuilding, such as marine engines and boilers. The plant is a large one, and its growth has been rapid. The plant has five shipways equipped with modern appliances for the handling of materials.

The New York Shipbuilding Co. which was incorporated under the laws of New Jersey in October, 1899, has an authorized capital stock of \$6,000,000, of which \$6,000,000 is outstanding. Its funded debt consists of \$2,300,000 first mortgage gold 6s, due 1923. The board of directors is made up of A. W. Mellon, Pittsburgh; Philip Wick, Youngstown; G. H. Walters, New York; George C. Jenkins, Baltimore; De Courcy May; S. M. Knox, Philadel-

phia; H. A. Magoun, Camden, N. J. Mr. May is chairman of the board, while Mr. Knox is president of the company.

In order to assist in meeting the requirements of the government's construction program, a certain amount of government work, if offered, will probably be taken by the new company, although the demands for the renewals of the fleets of the companies purchasing the yards, together with private business now on hand and in contemplation, will, it is estimated, use the entire capacity of the yards and proposed extensions for the next five years.

The New York Shipbuilding Co.'s plant appealed to the American International Corporation, it was said, because of its location, its new and efficient equipment, and its general adaptability to large scale production. Recently a 7,000-ton deadweight freighter was built in this plant and the trial run made in the remarkable time of 14 knots.

The cost of tonnage has risen in England until it is about the same as here. Buyers who get bids from both English and American yards find the English prices just as high as ours, whereas in the past they used to average perhaps a third lower.

As the New York Shipbuilding Co. has a large frontage, there is ample room for enlarging the plant. The proposed immediate extension contemplates the building of two shipways 150 feet wide by 1,000 feet long. These ways will give considerable additional capacity. In the plant as it now stands but little change in machinery and equipment is necessary, as that now in use is practically all of the latest and most efficient type.

Diesel Tanker Overhauled

In November, 1912, the motor-driven tanker, JUNO, was placed in service, and she was equipped with the first high-powered reversible diesel engine that the Werkspoor Co., of Amsterdam, built for marine purposes. This motor is 1,100 brake horsepower (1,460 indicated horsepower at 115 revolutions per minute with mechanical efficiency of 78 per cent, and a mean effective pressure of 105 pounds per square inch) or equivalent to about 1,300 steam indicated horsepower.

This ship was docked recently at Newport News to undergo Lloyds No. 1 survey, which takes place at the end of four years' service. According to Charles Bailey, chief engineer of the Newport News Ship Building & Dry Dock Co., Newport News, Va., a thorough examination was made of the hull and machinery, but very little work on the engine was found neces-

sary. One of the company's engineers accompanied JUNO to the Capes, and reported the running of the machinery as satisfactory.

JUNO is of 4,300 tons displacement, and carries about 2,500 tons of cargo, on a dead weight capacity of 2,675 tons, at an average loaded speed of 9¾ knots, and with a fuel consumption of a little under five tons of crude oil per day. Her engine has six cylinders, 22-inch bore by 39¾-inch stroke. Her engine room staff consists of chief, first, second and third engineers, four oilers and two cleaners. The lubricating oil consumption is stated to be about 20 gallons per 24-hour day. Her length between perpendiculars is 258 feet, with 45-foot beam, and 18½-foot draft, and her trial speed was 10½ knots. She is owned by the Anglo-Saxon Petroleum Co., London.

It may be remembered that with the

old design of Werkspoor diesel engines it was believed there was not enough space between the valves for cooling purposes, and about a year ago a new cylinder design was produced in which there is at least 4 inches of cooling water between every valve, and this was found to be so satisfactory that the builders were not contented with adopting it for new engines, but fitted the new design of cylinder to some of the older vessels in service. JUNO was one of these ships, and having the new cylinders, new pistons naturally had to be put in to fit and the opportunity was taken to use the latest design. A section of crankshaft also was fitted. This was at the beginning of the year, since when the engine has been running continuously. All this goes to prove how necessary is sea-going experience to produce a satisfactory design of marine diesel engine.

Los Angeles Ship Yard

APPPLICATION for the leasing for 30 years of 30 acres of tidelands at Los Angeles harbor, for use as a big ship yard, has been filed by E. G. Ekstrom as president of the new Los Angeles Ship Building Co. The company plans to build more than \$10,000,000 worth of ships annually and to employ at least 1,000 men when the plant is built.

"Our site will have a frontage of 3,000 feet on the west basin and will be sufficiently large to provide for a future dry dock to be built by our company in the event that the city is unable to make the desired improvement," said Mr. Ekstrom.

"Work will commence at once on the buildings of a ship building plant, fully equipped with modern machinery and capable of building five 8,800-ton ships at one time, three of which will be started at soon as the yard is ready.

"The ship building plant will cost between \$500,000 and \$750,000. Our company will specialize on a standardized steel freighter of 8,800 tons deadweight capacity, but it will also build 10,000-ton freighters and tankers and do general repair work in connection therewith. The company also expects to operate the proposed new dry dock the city plans to build in the near future and which will be an improvement that will be instrumental in bringing to this port the much needed bottoms to move local freight now routed through San Francisco.

"The officers and staff have been recruited from the big ship yards of the Atlantic and Pacific and all are men of over 20 years' experience in their re-

spective lines. The finances of the company, which were arranged by Henry Clarke, 1917 Leighton avenue, were obtained outside of Los Angeles and are ample to take care of every need."

In order to provide the company with the necessary site, it is proposed that the city shall do certain dredging of channels and fill the area to be used by the ship building concern; also that the ship building company shall advance the necessary funds for this work, the same to be applied on the rent that it is proposed the company shall pay the city for the use of the lands. It is announced that the new company has \$500,000 already deposited in a local national bank.

Acting Traffic Manager C. H. Matson of the harbor department, who has just returned from an inspection of ship building plants at San Francisco, said:

"The northern ship building plants are building at least \$50,000,000 worth of ships at the present time. The ship yards have more business than they can attend to. Eastern ship builders also have more than they can handle right now. The coming of the proposed ship-building plant to our local port means millions of dollars in business at Los Angeles Harbor. It behooves the city to get busy and pave the way for a big dry dock, which will be imperatively needed.

"This new company here proposes to invest at once between \$500,000 and \$750,000, and probably more as time goes on. Harbor business will jump ahead by leaps and bounds as a result of the business that this new concern will handle, the business to be handled by the Union Oil Co., which proposes

to invest at least \$2,500,000 in a plant at the harbor, the business to be handled by the Pacific Steamship Co., for which we are now planning to provide additional facilities, and the business that will come as the result of additional big enterprises desiring to become established at the local port.

"All of this means many million dollars' worth of business to be handled at the local harbor during the immediate future."

In its application for a site the company says that the proposed improvement is to be everything pertaining to a modern and up-to-date ship building plant for building steel and wooden vessels; also for marine and general repair work. The applicant expects to have the right to operate the proposed dry dock for the city. The company says the operation of a dry dock should be a paying investment for the city from the start. A certified check for \$100 accompanied the application to pay the expenses of granting the application, etc.

President Ekstrom of the company has stated that his company has prospects of building big ocean liners for the Swedish-American Line, each ship to cost about \$3,000,000. He said that the company already has in hand contracts covering the building of about \$5,000,000 worth of merchant ships to be constructed just as soon as the ship building plant is ready.

Henry Clarke, who has been looking after the finances of the company and who will be one of the directors of the company, is general superintendent of the F. O. Engstrom Co.

Morse to Build

Charles W. Morse, as president of the United States Steamship Co., has recently bought 30 acres of land on the east bank of the Thames river a mile north of the Hotel Griswold near New London, Conn., as a site for a ship yard. The company will build there a fleet of oceangoing freight ships for its own use.

Mr. Morse says construction will start as soon as possible; that the plant probably will be completed within two years and will employ between 4,000 and 5,000 men. It will be one of the largest ship building plants in the United States.

The company already owns a large plant at Noank, Conn., which it bought from Robert Palmer & Sons last May, and which employs 500 men. Six oceangoing freight steamships are being constructed there now.

When these are completed the Noank plant will probably be devoted to the construction of ships for freight transportation on the river and canal between New York and Buffalo and on the

Great Lakes. The product of the new plant will be deep sea vessels.

Mr. Morse said that the purchase meant not that the company planned any new departure but that it would expand the carrying operations which were started when Mr. Morse formed the United States Steamship Co. in December, 1915, by the combination of established concerns and capitalized it at \$25,000,000.

"As is well known," said Mr. Morse, "there has been an extraordinary demand for steamships since the war started and we are simply trying to do our share toward meeting it. We shall use the ships we build in our own business. They will be tramp steel freighters, going to any part of the world with cargoes."

"At the start we shall probably construct a fleet of 10 ships at the new yards. They will be of 6,000 or 8,000 tons apiece—probably all of the same size. After these other ships will probably be built. The property we have bought is roomy. It has 2,200 feet of river front."

On a trip to Europe early last summer Mr. Morse invested several million dollars in chartering and buying steamships to ply between London and Archangel, London and South Africa, Cardiff and Mediterranean ports, and be-

tween United States and English ports. It became known at that time that the company's revenue from a single voyage of its steamship *ORURO*, from New York to Archangel with Russian supplies, was \$80,000. The original cost of the vessel was \$55,000.

One of Mr. Morse's associates said: "Under the existing high freight rates it is quite possible to pay for a ship from the freight charges on a single trip to Russia. That is what we had in mind when the companies were started."

Mr. Morse bought in December, 1915, four great lake steamships — the *WILLIAM CASTLE RHODES*, *ST. PAUL*, *HURON* and *MINNEAPOLIS*—which were owned by railroads and had to be sold under a decision of the interstate commerce commission. He brought them to New York and put them into the ocean trade.

In August he bought the 20,000-ton *MINNESOTA*, the largest vessel flying the American flag, from the Great Northern Steamship Co., and sent her to Russia with coal. Other ships have been purchased, but the Morse company has been unable to buy or build enough. Hence the plan for the new ship yard on the Thames. The site was purchased from H. G. Rowe. Mr. Morse declined to state the price.

New Ship Yard at Tacoma

A NEW ship building company, financed in part by New York capital, at Tacoma, Wash., where 100 acres have been purchased as a site, is announced by Chester Thorne, banker, New York. The new company, which is to be known as the Todd Shipbuilding & Dry Dock Co., with William H. Todd serving as president, will construct ships of all tonnage, according to Mr. Thorne's announcement, and be in a position to commence operations in about four months. Mr. Todd is president of the Todd Shipyards Corporation of New York.

Although all of the details of the undertaking were not announced, it was learned that \$1,000,000 has already been subscribed as a working basis for the company. Of this amount \$500,000 was subscribed by bankers and business men of Tacoma, represented by Mr. Thorne in the transaction. The remainder was contributed by the Todd Shipbuilding Co.

This company already has extensive holdings on the Pacific coast, one of its western concerns being the Seattle Construction & Dry Dock Co. The company also owns the Erie Basin Dry Dock Co. of Brooklyn and the Tietjen & Lang Dry Dock Co., of Hoboken. The company was incor-

porated June 14, 1916, in New York, acquiring through stock ownership the properties and business of the Robins Dry Dock & Repair Co., the largest ship repair yard in New York harbor.

"The site purchased for the new ship building and dry dock company," Mr. Thorne said, "covers 100 acres of tide lands at Tacoma. There is, I believe, only one other company with so extensive a site, this being the Union Iron Works at Alameda, Cal."

"The venture originated in the conviction that the present tremendous demand for ships will continue for several years. The Todd Shipyards Corporation owns the Seattle Construction & Dry Dock Co., but the yards of that company were working to capacity, and it was necessary to find additional facilities elsewhere. Tacoma being very anxious to have the yards located there, its business men subscribed \$500,000 as an inducement."

"This generous offer was accepted several days ago by William H. Todd, the president of the Todd Shipyards Corporation. Mr. Todd has announced that he will be ready to lay the first keel within four months after the technicalities of organization have been disposed of, which I do not think will take long."

What the Government is Doing

Rulings on Marine Matters

Improvements to Waterways

Hints to Navigators

Naval Building Program is Under Way

OF THE 66 vessels carried in the 1917 building program of the naval act, Secretary of the Navy Daniels has awarded contracts for 58. The others are four battle cruisers, three scout cruisers and one ammunition ship. Bids for the battle cruisers were opened Dec. 6, readvertised bids for the three scout cruisers will be opened Jan. 3, and tenders for the ammunition ship will be opened Jan. 1.

Contracts for the 58 vessels, including four battleships, one scout cruiser, 20 torpedo boat destroyers, 30 submarines, one fuel, one hospital ship and one gunboat were let as follows:

Two battleships, MARYLAND and WEST VIRGINIA, both flagships, to the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., contract price \$11,235,000 each; delivery in 39 and 45 months.

Two battleships, COLORADO and WASHINGTON, \$11,450,000 each, New York Shipbuilding Co., delivery in 39 and 45 months.

One scout cruiser to the Seattle Construction & Dry Dock Co., Seattle, Wash., \$4,975,000, delivery in 30 months.

Eight torpedo boat destroyers to the Fore River Shipbuilding Corporation, Quincy, Mass., \$1,160,000 each, one in 24 and others in 30 months.

Six torpedo boat destroyers to the Union Iron Works Co., San Francisco, four at \$1,190,000 each, and two at \$1,185,000 each, delivery in 22, 23, 24 and 25 months and two others in 26 months.

Four torpedo boat destroyers to the Bath Iron Works, Bath, Me., at \$1,150,000 each, delivery in 22, 23, 24 and 25 months.

Two torpedo boat destroyers to the Mare Island, Cal., navy yard at \$968,105 each (estimated), delivery in 18 and 20 months.

Eighteen coast submarines to the Electric Boat Co. at \$697,000 each.

Six coast submarines to the Lake Torpedo Boat Co., at \$694,000 each.

Three coast submarines to the Cali-

fornia Shipbuilding Co., at \$698,000 each.

One 800-ton fleet submarine to the Electric Boat Co., at \$1,189,000.

One 800-ton fleet submarine to the Lake Torpedo Boat Co., at \$1,195,000.

One 800-ton fleet submarine to the Portsmouth, N. H., navy yard; one fuel ship to the Boston navy yard; one hospital ship to the Philadelphia navy yard, and one gunboat to the Charleston, S. C., navy yard, estimates not being given out in the four latter instances. Delivery of submarines is to begin in about two years.

The bid of the Newport News company on two battleships was \$10,375,000 each, \$50,000 to be added for each ship if equipped as a flagship. It developed, however, that this bid was revised in view of the fact that the Newport News company, like the New York Shipbuilding Co., revised its tenders so that it instead of the navy department is to assume responsibility for obtaining and installing the electric drive machinery specified by the department.

It is thought that the ammunition ship will be awarded to a navy yard. Readvertisement of bids for the three scout cruisers was made necessary by reason of the fact that the bid of the Seattle company was the only one that could be considered, the other bids having carried conditions which made it impossible to make awards on the basis of their provisions.

Use Oil to Calm Lake

When the steamer MARSHALL F. BUTTERS founded during a heavy gale, Oct. 20, off Southeast shoals, Lake Erie, the rescue of the crew by the steamer FRANK BILLINGS, Capt. F. B. Cody, was effectively assisted by spreading oil from BILLINGS to the windward of the wreck. BUTTERS was laboring heavily in the trough of the sea. Captain Cody, in a letter to the branch hydrographic office at Cleveland, says: "I circled around her twice and when to windward of her,

about 500 yards distant, used about half a barrel of regular storm oil, delivering it by hose through the forward scuppers; then applied about 60 gallons of black oil through one of the spar deck scuppers. The storm oil seemed the more effective, spreading much faster; and I noticed its effect on the sea surrounding the wreck almost immediately, to such an extent that a yawl boat was launched from BUTTERS and manned by nine of her crew without any trouble. The three men whom I rescued from the water stated that they had noticed the difference as soon as the oil took effect."

Effects of Collision on Concrete Pontoons

Apropos of the discussion of the possibilities of concrete vessels, aroused by the building in Sweden of reinforced concrete barges for use in sea ferries, the experience of two concrete pontoons at the time of the flooding of the dry dock entrance basin at Balboa, Panama canal zone, is of interest.

These were rectangular pontoons, 120 feet long by 28 feet wide by 8 feet deep, with bottom, sides, and deck of reinforced concrete. They were built to be used as landing stages for boats up to 65 feet in length. The reinforcement in each contained approximately 45,000 pieces of steel, weighing 67,783 pounds, and aggregating 107,493 lineal feet. The concrete in each is about 186 cubic yards. Buffer timbers were affixed at the ends and sides by means of anchor bolts. The pontoons were built on the floor of the dry dock while the latter was in course of construction. In anticipation of the removal of the cofferdam which had kept the dock in the dry, water was pumped over the dam to allow the pontoons to be floated out, after which the gates of the dock were closed and the dock pumped out to allow work on its floor to continue. The pontoons were moored outside the gates.

At the time of the blowing up of the cofferdam the surface of the water in

the entrance basin was about 15 feet below the mean tide level. The gap made by the explosion did not allow the water to pour in from the sea until the tide rose.

The stream which broke over the dam at high tide cut an increasing channel in the earth, resulting in a strong inrushing current. The current was sufficient to make the barges part their moorings and circle about the basin. In so doing one of them struck one of the fender piles along the face of the south entrance pier, and broke it at a point about 20 feet below the butt, where its diameter was about 12 inches. The barge groaned under the impact, and one of the end timbers was sheared off, dragging its anchor bolts through the concrete and causing it to crack. This damage was above the water line. In other respects the pontoon was uninjured. The two pontoons collided once in their course around the basin, but this did no damage to either.

Both pontoons have been in regular use since that time as landings, and are standing the service well.

Who Will It Be?

Delay in obtaining acceptances will probably postpone the appointment of the shipping board by President Wilson longer than expected. The selection of Bernard N. Baker, Baltimore, for a place on the board is accepted by authorities at Washington as practically settled. It is said, furthermore, that President Wilson has Mr. Baker's letter of acceptance. Mr. Baker early in the summer took an unwritten option on office quarters in a Washington building. This was allowed to lapse at the time but it is understood that the option may be renewed at any time. It is understood that the quarters were desired for the accommodation of the shipping board. In view of the fact that there has been displayed no hurry to renew the option, it is believed that the President will delay several weeks before naming the board.

According to rumor, it is said that the President has received the acceptance of William Denman, of the Pacific coast, an admiralty lawyer. W. H. Britton, New York, has often been mentioned as a possible candidate, but nothing further than this is known now. One candidate prominently mentioned is F. C. Donald, of Chicago, who is considered an expert in the question of passenger transportation. While Mr. Donald is a railroad man, he is considered admirably equipped for the work.

Philip Manson, who was previously closely allied with the southern com-

mercial congress, has been urged for appointment, as has A. B. Farquhar, a manufacturer of York, Pa. A. L. Thurman, of Ohio, the present solicitor of the department of commerce, has been a possible appointee, but it is understood now that Mr. Thurman is preparing to return to his private law practice in Ohio.

November Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of November, 1916, as follows:

Lakes.	Ft. above mean sea level.
Superior	603.50
Michigan-Huron	580.64
Erie	571.70
Ontario	245.65

Lake Superior is 0.22 foot lower than last month, 0.69 foot higher than a year ago, 1.07 feet above the average stage of November of the last 10 years, 0.01 foot below the high stage of November, 1900, and 2.00 feet above the low stage of November, 1879. During the last 10 years the November level has averaged 0.2 foot lower than the October level and 0.2 foot higher than the December level.

Lake's Michigan-Huron are 0.08 foot higher than last month, 1.16 feet higher than a year ago, 0.49 foot above the average stage of November of the last 10 years, 2.28 feet below the high stage of November, 1876, and 1.46 feet above the low stage of November, 1895. During the last 10 years the November level has averaged 0.3 foot lower than the October level and 0.1 foot higher than the December level.

Lake Erie Levels

Lake Erie is 0.20 foot lower than last month, 0.25 foot higher than a year ago, 0.06 foot below the average stage of November of the last 10 years, 1.97 feet below the high stage of November, 1861, and 1.00 foot above the low stage of November, 1895. During the last 10 years the November level has averaged 0.3 foot lower than the October level and 0.1 foot higher than the level during the month of December.

Lake Ontario is 0.41 foot lower than last month, 0.71 foot higher than a year ago, 0.13 foot above the average stage of November of the last 10 years, 2.17 feet below the high stage of November, 1861, and 2.24 feet above the low stage of November, 1895. During the last 10 years the November level has averaged 0.2 foot lower than the October level and 0.1 foot higher than the level during the month of December.

Soo Canal Traffic

During November, 8,751,335 net tons of freight passed through the canals at the Soo, 1,259,053 going through the Canadian canal and 7,492,282 tons through the American canal. This brings the total movement of freight up to Dec. 1 up to 89,125,844 tons, showing a considerable increase over the figures for Dec. 1, 1915, which totaled 59,941,454 tons. The heaviest tonnage was that of iron ore, of which 5,894,845 tons were carried eastward. Wheat carried in November, 1916, shows a decrease of 45,868,495 bushels from the amount moved in November, 1915, while grain shows a decrease of 5,087,539 bushels. The coal movement for November, 1916, also shows a loss compared with that for November, 1915, the decrease being 367,826 tons.

Following is the summary of freight moved up to Dec. 1, 1916, with comparative data for 1915:

EAST BOUND

	To Dec. 1, 1916.	To Dec. 1, 1915.
Copper, net tons.....	122,796	117,651
Grain, oth. than wheat, bushels	83,420,259	35,195,203
Flour, barrels	8,202,139	6,664,067
Iron ore, net tons.....	62,183,593	40,638,322
Pig iron, net tons.....	12,050	15,640
Lumber, M. ft. B. M.	339,563	416,352
Wheat, bushels	203,701,009	131,926,082
Unclass. frgt., net tons ..	319,691	267,837
Passengers, number....	28,009	22,262

WEST BOUND

Coal, anthracite, net tons	2,076,901	1,708,922
Coal, bituminous, net tons	13,508,955	9,749,346
Flour, barrels	13,381	100
Grain, bushels	9,245	31,623
Mixed iron, net tons..	160,278	158,515
Iron ore, net tons.....	1,500
Salt, barrels	704,227	603,586
Unclass. frgt., net tons	1,181,673	1,093,133
Passengers, number ..	24,345	24,331

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons.	71,962,372	47,139,174
West bound, net tons.	17,163,472	12,802,280
Total	89,125,844	59,941,454
Vessel passages	24,645	18,138
Net registered tonnage	68,022,114	47,862,258

Want Deeper Water

Representatives of industrial enterprises and commercial organizations on Staten Island and the New Jersey waterfront along New York bay, appeared recently at a public hearing before Lieut. Col. C. H. McKinstry, of the United States corps of engineers at the custom house, New York, to advocate the widening and deepening of the ship channel from the ocean to Perth Amboy through Raritan bay, Arthur Kill, Staten Island sound, the channel north of Shooters Island and Kill Van Kull to upper New York bay. At the present time, no vessels more than 23 feet in draft can use these waters. A 30-foot channel is asked.

How Efficient Are Paddle Wheels?

A Study of the Design of Side and Stern Wheels—Feathering Paddles Gain Efficiency at Expense of Thrust

By E. M. Bragg

IN THE year 1913 tests were made in the model basin of the University of Michigan upon certain models of radial and feathering paddle-wheels. These tests were made for a board of army engineers appointed to investigate the question of towboats and barges for the Mississippi river. The complete report upon the subject can be found in House Document No. 857, entitled "Experimental Towboats". Since the publication of this report I have taken the results for feathering wheels and plotted them in a more compact form and have compared the results obtained from the model wheels with those for full-sized wheels. It may not be out of place to call attention to some of the differences which exist between radial and feathering wheels. Radial paddles give more thrust than the feathering for the same slip, but work at a lower efficiency. The radial wheel has its maximum efficiency at about 10 per cent slip, while the maximum efficiency of the feathering wheel occurs at about 15 per cent slip. The efficiency for both types decreases with increase of dip, but the decrease is less for feathering blades than for radial blades.

Eccentricity Ratio

The eccentricity ratio is usually between 0.55 and 0.70. Larger values of eccentricity ratio are accompanied by a reduction of thrust and an increase in efficiency, dependent upon the slip. For each position of the eccentric and each dip of the blade there is a certain slip at which the blade will enter the water without disturbance. If the slip is less than this amount, there is pressure upon the back of the blade when it first enters, and if the slip is greater there is pressure on the driving face when the blade enters the water. The author's investigations would seem to indicate the desirability of using a true slip of about 15 per cent and an eccentricity ratio of about 0.55. While a larger eccentricity ratio would give a slight increase in efficiency, the thrust would be considerably smaller and a larger, heavier wheel would be needed. Wheels are often made with the eccentric placed from 0 inch to 4 inches above the

center of the wheel. It does not seem probable that this has any appreciable effect upon the thrust or efficiency.

The dip ratio is the ratio of the greatest immersion of the blade to the width of the blade. The thrust increases with increased dip, but the efficiency falls off. The true dip used will depend upon what is of most importance in the design in hand, efficiency or power.

For Stern Wheel Boats

The object of the model tests was to determine the best proportions for stern wheels on boats of moderate speed. The dip ratios used were between 1 and 1.5. In applying these results to side wheels on boats of rather high speed it was necessary to extend the curves to dip ratios of 2.5. This was done on the assumption that the maximum thrust would occur when the wheel was immersed to the center and that the thrust would be approximately zero when the wheel was fully immersed.

The pitch ratio is the ratio of the distance between the trunnions, measured on the arc of the circle, to the width of the blade. As a rule, it would be better to sacrifice a little thrust in order to gain in efficiency. If a blade-width ratio of 0.16 is used, a pitch ratio of 1.85 would call for nine blades in the model wheel, while a pitch ratio of 1.5 would call for 11 blades. At 15 per cent slip the unit pressure at pitch ratio 1.85 is 1.6 pounds and the efficiency is 0.668, while at pitch ratio 1.5 the thrust is 1.66 pounds and the efficiency is 0.64. Each of the nine blades would have to be 4 per cent larger than each of the 11 blades, but the efficiency would be a little over 4 per cent greater, and the total blade area would be about 86 per cent of the 11-blade wheel. Some designers use a large number of blades to reduce vibration.

An attempt has been made to correlate the results obtained from model feathering wheels with the trial trip results of full-sized wheels. It is obvious that the location of the wheel relative to the bow wave is going to influence the working of the wheel to a large degree. In the determination of the wheel location relative to the crest of the bow wave it was assumed that the length of the wave created by the passage of the boat would be $0.5573 V^2$, and that the first crest would be 12 per cent of the wave length aft of the bow.

V is the velocity of the boat in knots per hour. It will be noticed that the maximum quantities do not occur at the wave crest, but a little aft of it. This seems plausible when it is considered that the blades enter the water some distance forward of the center of the wheel and it is the first part of the stroke which is most effective. Also the wheels have considerable length, and the wave crests are not parallel to the axis of the wheel, but rake aft. Another possibility is that the wave crest is more than 12 per cent aft of the bow.

The model wheels, when tested in the tank, were not adjacent to the hull of a boat, and by reason of this condition the dip observed when at rest would be very close to the dip when in motion. The apparent slip and true slip of the model wheel would be practically the same. The only condition tending to affect these would be the velocity of approach of the water to the wheel, which would be very small.

Side Wheel Conditions Different

The paddle wheel of a side wheel boat is working under quite different conditions as regards dip and slip. The velocity of approach would be somewhat larger, due to the proximity of the hull. Due to the passage of the boat through the water there will be stream-line flow, wake and waves. The dip of the blades when the boat is in motion may differ considerably from the dip when at rest, depending upon the part of the wave in which the wheel is working. The true slip of the wheel will differ from the apparent slip because of the velocity of approach, wake, stream-line flow, and orbital motion of the water in wave formation. If the wheel is working in the hollow of the wave all of these except the wake make the true slip less than the apparent slip. If the wheel is working in the crest of the wave the wake and orbital motion are opposed to the stream line flow and velocity of approach, and the true slip is probably greater than the apparent slip. It would appear, however, that the change in slip is much less in degree than the change in dip.

In addition to this uncertainty regarding the true slip and true dip of the full-sized wheels, there is further uncertainty regarding the variation of thrust with speed of advance. The usual assumption is that the thrust varies as

Abstract of a paper presented at the twenty-fourth general meeting of the Society of Naval Architects and Marine Engineers, New York, Nov. 16-17, 1916. The author, E. M. Bragg, is assistant professor of Naval Architecture, University of Michigan, Ann Arbor, Mich.

the square of the speed of advance. The models were all tested at a speed of advance of 100 feet per minute, while the full-sized wheels moved at a velocity of about 2,000 feet per minute. The model wheels were practically 1

advance seems to give a reasonable variation of the dip along the wave. For purposes of design either the slip factor curve or the dip factor curve could be used. The different points which determine the curves lie as nearly in a fair curve as could be expected.

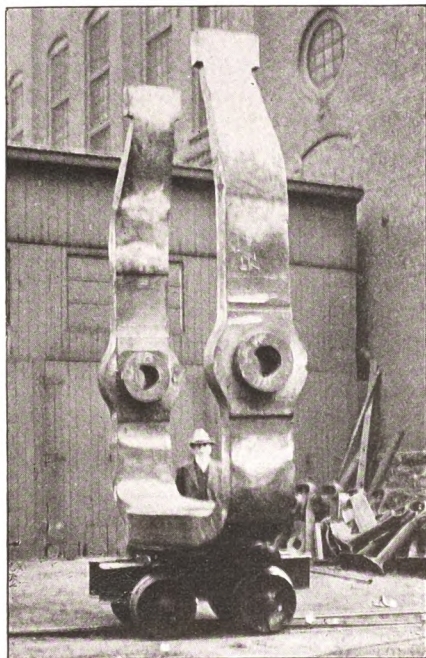


FIG. 1—YOKE FORGING COMPLETED

foot in diameter, while the full-sized wheels were from 25 feet to 30 feet in diameter. According to the law of comparison the corresponding speed for the full-sized wheels would be about $100\sqrt{30}$, or about 550 feet per minute. The full-sized wheels were advancing at speeds which were three to four times the corresponding speed.

With these three unknown conditions—namely, the variation of thrust with speed of advance, the variation of true dip from the observed dip at rest, and the variation of true slip from the apparent slip—it can be readily seen that there are a large number of relation factors which might be derived, depending upon the assumptions made regarding one or all of the unknowns.

It is obvious that the variation in dip is affected by the size of wave formed by the boat, and the size of the wave will vary with the speed-length ratio and the displacement-length ratio. The efficiency obtained by using the apparent dip may differ quite widely from the actual efficiency. In the hollow of the wave there is a loss of dip of about 35 per cent, while in the crest there is a gain of about 60 per cent. A small portion of this loss and gain makes allowance for the fact that we have assumed the true slip to be equal to the apparent slip, whereas actually it is less in the hollow and more in the crest. The assumption that the thrust varies as the 1.75 power of the speed of

Big Unloading Yoke

The rapid development of the self-unloading type of freighter on the Great Lakes has necessitated the use of unloading facilities of larger and larger capacity. The magnitude of the equipment now used is strikingly illustrated by a 12-ton yoke forging manufactured by the Delaney Forge & Iron Co., Buffalo, N. Y., for the self-unloading freighter W. F. WHITE, which was launched last year by the American Ship Building Co., at its Lorain, O., yards. W. F. WHITE is 550 feet long, with a cargo capacity of 10,000 tons. The unloader is designed to deliver cargo at the rate of about 1,700 tons per hour on any dock within 150 feet of the vessel's center line.

The yoke forging is used to carry the boom, the hopper and the machinery operating the main carrier belt, which is driven by an 11-inch shaft extending upright through the forging's center hole, the boom being carried on milled trunnions. The yoke is 42 feet long, 48 inches at its widest part, and $10\frac{1}{2}$ inches thick at its center. Fig. 2 shows it immediately after forging. All slot-

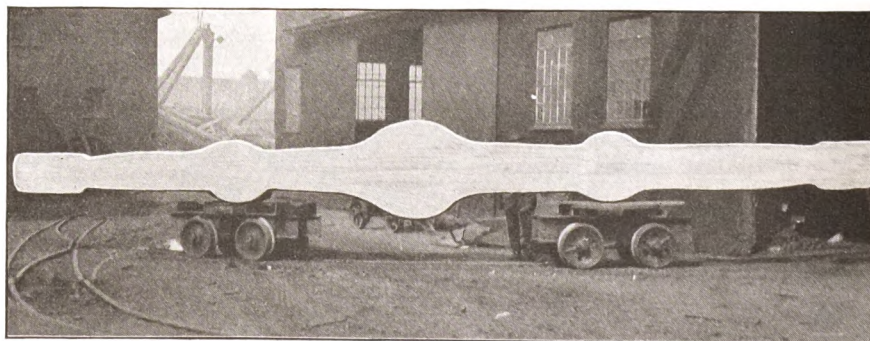


FIG. 2—TWELVE-TON YOKE FOR SELF-UNLOADING LAKE FREIGHTER. IMMEDIATELY AFTER FORGING

ting, planing, boring and milling were finished before the yoke was bent. Fig. 1 shows the yoke ready to ship.

Major Edward H. Schulz, of the United States engineering corps, stationed at New Orleans, has filed a report with the secretary of the Alabama state harbor board, announcing that, despite the storm, Mobile's harbor and bar have not shoaled. According to this report, the least depth found on the bar was 27 feet at mean low water, while along the ship channel, the least depth was 26 feet at mean low water.

Death of W. C. Cuntz

William Cooper Cuntz, general manager and a director of the Goldschmidt Thermit Co., New York, died recently at Auburndale, Mass., where he had gone to benefit his health, which had been impaired by an operation for appendicitis a year before.

Mr. Cuntz was born at Hoboken, N. J., in 1871. After graduating from the Stevens Institute of Technology, in 1892, he became associated with the Pennsylvania Steel Co., Steelton, Pa. He was first in the bridge and construction department, later entering the sales department, where he served as assistant general manager of sales in Philadelphia, and later as district sales manager at Steelton. In 1910 he became a director and the general manager of the Goldschmidt Thermit Co. Under his management the business of the company has largely increased.

Trip Made in Twelve Days

The New York barge canal trip is described by Capt. Louis King, of the steam consort RED JACKET, who with a tow of four other boats has made his third trip on the newly opened Champlain canal. Capt. King runs his fleet between Port Henry, N. Y., and Elizabethport, N. J., carrying cargoes of iron ore from Port Henry to New Jersey. Capt. King said:

"The round trip takes me 12 days, although I have made it in 11, carrying

approximately 700 tons of iron ore and running on a 5-foot 6-inch draft. This could easily be reduced to 10 days if it was desired to run at night, and it is a very easy matter to do this because of the splendid buoy system."

For next season Capt. King intends to place four more fleets in operation on this waterway. The type of barge that will probably be adopted will consist of a steam or motor-driven barge and a consort, each being approximately 300 feet in length and having a width and draft that will enable each to carry 1,500 tons of produce, or 3,000 tons in all.

On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Lake Season Winds Up With a Flourish

By A. A. Eiben

GREAT activity marked the closing of the 1916 navigation season on the Great Lakes. Weather conditions early in December were more favorable than usual, affording the fleet better dispatch than ordinarily obtained during the closing days. Some cargoes were loaded after Dec. 12, but these were carried almost exclusively by vessels operating without insurance. Excellent freight rates were paid on all commodities. Ore rates ranged from 55 cents to \$1, while one charter was reported at \$1.25 on a cargo to the head of the lakes. On grain from the head of the lakes to Buffalo, shippers bid 4½ cents. This bid, however, did not guarantee full loads by midnight Dec. 12. Some coal charters were made at 75 cents to Lake Superior, \$1 from Buffalo to the head of the lakes on hard coal, \$1.25 to the Soo, and \$1 on medium sized vessels to Milwaukee.

The demand for ocean tonnage continues unabated, the American Ship Building Co., Cleveland, having booked three additional contracts for salt water steamers early in December. The vessels will be Welland canal size and will come out during the last half of 1917. The Toledo Ship Building Co. also closed contracts with eastern parties for two additional steamers of Welland canal size. These vessels will be duplicates of the four now building by the Toledo company for A. R. Lewis, of New York, for 1917 delivery.

The three mammoth steamers of the Shenango Steamship & Transportation Co., Col. J. M. SCHOONMAKER, SHENANGO and WILLIAM P. SNYDER JR., are moored at Buffalo for the winter, all of them carrying storage grain. The combined tonnage of all three vessels aggregates 1,344,844 bushels, valued at \$2,692,266. SHENANGO's cargo of 445,000 bushels of flax at \$3 per bushel, represents the most valuable cargo that entered the port of Buffalo during 1916.

The Canadian steamer VALCARTIER was recently purchased by the Sault Shipping Co., Ltd., from the Lake Commerce, Ltd., Toronto, Ont. She will be delivered to her new owners after the close of navigation and will be operated under the management of the Algoma Steel Corporation, Sault Ste. Marie, Ont. VALCARTIER was formerly the American steamer WILLIAM HENRY MACK, of the Jenkins fleet. She has a carrying capacity of about 5,000 gross tons.

Tug men at Toledo are fighting the proposed ordinance to charge lake freighters dockage for wintering in Bay

View Park harbor at Toledo. The towing companies contend that if the ordinance goes into effect, the larger lake vessels will not moor there, resulting in a considerable loss of business to the tugs.

The wrecking steamer FAVORITE has been ordered to the stranded steamer CAROLINA, of the Goodrich Transportation Co. CAROLINA stranded on the rocks seven miles south of the entrance to Sturgeon Bay canal entrance, Lake Michigan. Her bottom is badly damaged and her tank tops are gone. Heavy weather has hampered wrecking operations on the vessel.

The new steamer SIR TREVOR DAWSON arrived at Buffalo Dec. 8 on her first trip, carrying a cargo of 406,221 bushels of winter storage grain. She was commanded by Capt. Henry Hinslea, of Cleveland.

Captain Frank Harmon, 79 years old, died at his home in Toledo on Dec. 4. Capt. Harmon sailed on the Great Lakes in the early days of navigation as master of MARY A. GREEN.

The steamer J. P. MORGAN, of the Pittsburgh Steamship Co.'s fleet, was placed in dry dock at the yard of the Toledo Ship Building Co., Toledo, early in December. MORGAN suffered severe damage when she ran ashore at Mackinaw in November. About 40 plates had to be replaced.

It is estimated that grain receipts at Buffalo for the season of 1916 will be about 5,000,000 bushels less than in 1915. The figures up to and including Nov. 30 were 155,368,934 bushels for 1916, compared with 161,491,385 bushels in 1915, a decrease of 6,122,451 bushels.

According to figures compiled by the Tomlinson Co., Duluth, receipts of coal at Duluth-Superior for the season of 1916 up to Dec. 1 were 8,959,600 tons, an increase of 907,489 tons over the corresponding period in 1915, which were 8,052,111 tons.

Statistics compiled by the chamber of commerce, Milwaukee, disclose a shortage of coal receipts at that port on Dec. 1. The 1916 figures show a decrease of 229,555 tons of hard coal, compared with 1915, while soft coal fell behind over 200,000 tons.

Michael Klinkenburg, assistant engineer on the steamer WILLIAM NOTTINGHAM, of the Great Lakes Steamship Co.'s fleet, filed suit against the steam-

ship company, in the Chicago district court, on Nov. 28, asking \$6,000 damages for personal injuries. Within half an hour after the claim was filed, attorneys for the defendant appeared before Judge George A. Carpenter, stating that the claim was just and paying the amount demanded. Mr. Klinkenburg lost an arm as the result of an accident which occurred at Sandusky on July 7, 1916.

Capt. Charles Ahlstrom, second mate on the steamer THOMAS SHAUGHNESSY, who was struck by a piece of ore while the vessel was loading at Superior, died at St. Mary's hospital in that city.

The wooden steamer MOHEGAN has been sold for service on the coast by L. P. Graves & Co., Buffalo. MOHEGAN was built in 1894, and was operated in the lumber trade on the Great Lakes.

Negotiations are being made for the purchase of the steamer AMERICA, of the Crosby Transportation Co.'s fleet, by salt water interests. CONESTOGA and THOMAS DAVIDSON, of the Crosby line, also have been offered for sale, and if sold, it is likely that these vessels will be replaced by two steamers now engaged in Pacific coast trade, JEFFERSON and DAUPHIN. A deal for the purchase of the latter two vessels is reported pending.

On the Chesapeake

By Hollis F. Bennett

The Baltimore & Carolina Steamship Co. proposes to operate a new line of shallow-draft steamers between Baltimore, Norfolk and points on Pamlico and Albemarle sounds by way of the Chesapeake and Albemarle canal. The new wooden steamer SARAH WEEMS, nearing completion at the yards of M. Mitchell Davis & Sons, Solomous island, Md., will inaugurate the new service. All freight between the above points is now carried by barges and sailing vessels. The new line will give regular service and obviate costly delays.

C. C. Paul & Co.'s new four-mast schooner under construction at Milford, Del., is to be named ALFRED F. PAUL, after one of the members of the firm.

The Baltimore tug ALBATROSS broke her tail shaft off Chincoteague, Va., last month, and was towed back to Norfolk by the tug DEFIANCE. The tug RESOLUTE proceeded with the ALBATROSS tow.

The American steamship SIBERIA, reported ashore and breaking up on the "downs" in the English channel, was

formerly the Hamburg American liner of the same name and was interned in Baltimore at the beginning of the war. She was purchased by the Atlantic Fruit Co., and brought under American registry in the above port.

The Nova Scotia schooner *PERCE*, Capt. Koliler, fresh from her builders' yards, established a sailing record in the Chesapeake by reeling off the 59 miles from Cove Point to Baltimore in six hours and 15 minutes. *PERCE* was built by Robin, Jones & Whitman, Halifax, N. S., and is a three-mast vessel of 308 tons.

For the first time in a great number of years, phosphate is being exported from Baltimore. The big Danish four-mast sailing ship *Soloro* is loading a full cargo for Copenhagen, Denmark, and the schooner *PERCE* will load a similar cargo for Halifax, N. S.

Around Puget Sound

By F. K. Haskell

The North Pacific is feeling the effect of the shortage of steamers harder now than at any time since the European war opened. During the past month Portland custom house clearings were accounted for with just four vessels. The entire value of the shipments was \$84,676.16. Ten coastwise steamers carried 7,030,000 feet of lumber to California and Alaska ports.

Because a vast number of men of the merchant marine of Great Britain have answered the call to the colors, the Harrison Direct line, which operates a fleet of carriers between Seattle and ports in the United Kingdom, has been compelled to employ Lascar crews shipped in East India. The big freighter *DRAMATIST*, which arrived in Seattle recently, had a crew of 56 natives of East India.

Increasing its Seattle fleet to nine big steamships, the Osaka Shosen Kaisha has ordered the new freighter *SIAM MARU*, recently completed in Japanese yards, and the liner *SEATTLE MARU* to North Pacific trade. It is also probable that the new freighter *BURMA MARU* will also be placed in Seattle trade.

Capt. Frank M. White, a veteran Alaska navigator and president of the Shipmasters' Association of the United States, has been appointed to the command of the schooner *NORHLAND*, which bears the distinction of being the largest American vessel of her rig afloat. *NORHLAND* was purchased by a Grecian firm, but will remain under the American flag until after the European war is ended.

Pointing out that the dangers to navigation on the west side of San Juan island are the greatest on the entire route followed by the big fleet of freight and passenger vessels plying between Puget Sound and ports in British Columbia and Alaska, the Shipmasters' Association of the United States, has petitioned the federal light-house department asking that a light be installed at Lime Kiln. Canadian ship-

ping interests have opposed this action, urging that the light be placed at Kelp Bluff, which is a little farther north.

Fifty-three wooden vessels suitable for coastwise or overseas lumber traffic are now in course of construction in Oregon, Washington and British Columbia. In the construction of these vessels, approximately 106,000,000 feet of lumber will be used; when completed, their combined carrying capacity will be 79,500,000 feet per trip. While the new tonnage is for the most part being built specifically for the lumber trade, comparatively few of the vessels in course of construction are to be operated by mill companies.

The adoption of a constitutional amendment exempting from taxation all ships of 50 tons or more capacity by a majority of 50,000 votes in the November election held in Oregon, is now being seriously considered in Washington and steps will be taken to urge upon the incoming legislature the need

of similar legislation to protect the shipping business of Washington and further increase its commerce. The amendment to the state constitution of Oregon provides that "all ships and vessels of 50 tons or more capacity engaged in passenger, coasting or foreign trade, whose home ports of registration are in the state of Oregon shall be and are hereby exempted from all taxes of every kind whatsoever excepting taxes for state purposes, until Jan. 1, 1935.

The Dominion government has authorized the construction in British Columbia by the government of two ocean-going steamers. They are to ply between Vancouver and Halifax via the Panama canal. The object, which the authorities have in view is the establishment of a line of Canadian steamers to handle the transcontinental freight in competition with the railways and thus exercise a control of railway rates. Several freighters are to be purchased on the Atlantic coast and it is expected within a year to have a half dozen vessels in operation.

The Mississippi Delta

By H. H. Dunn

THE American steamer *WILLIPA*, 1,200 tons, valued at \$125,000 and loaded with \$30,000 worth of mahogany, was lost on the reefs off Cape Gracias, Nicaragua, late in November, according to reports received by H. S. Renshaw & Co., New Orleans, agents for the steamer. Capt. Charles Johnston, New Orleans, and his crew of 22 men escaped by taking to the boats in the surf which pounded the vessel to pieces. James Raugh, supercargo for the Freiberg Lumber Co., Cincinnati, owners of *WILLIPA*'s cargo, and the only other person on board, also was saved, and sent the information concerning the loss of the steamer.

Bernard Strauss, one of the oldest river men on the Mississippi, died in his New Orleans home, late in November, after an illness of four weeks. He had been a resident of New Orleans for 56 years. He was agent for the Carter Packet Co., which operates a line of steamers on the river. Nearly 100 representatives of steamboat lines, river captains and others connected with the shipping industry, attended the funeral.

Members of the United States commission on navy yards and naval stations made an extensive investigation and inspection of the navy yard at Algiers, across the river from New Orleans, in the last week of November, to determine its availability as a general navy repair yard and base for submarine operations in the gulf, as well as for use for an aviation school. No comment was obtainable on the result of the inspection here.

The seagoing tug *J. W. THOMPSON* has been sold by Contractor J. W. Thompson to agents of the allies for \$135,000, cash. The boat is now being overhauled in New Orleans, her furnaces changed to coal burners and a wireless plant installed. As soon as this work is completed, the tug will sail for

the Azores to take part in the European war. The boat was built in 1909 by John Dialogue, of Philadelphia, at a cost of \$65,000, and is 112 feet long, 21-foot beam, with draft of 13 feet. Her engines are 550-horsepower. She has been operating on the Mississippi and in the waters of the gulf for some years.

Nicolas Segrera, agent of Veloz, Dames y Cia., large owners of cane and cattle plantations in Colombia, S. A., is trying to establish better freight and passenger service between Cartagena and New Orleans by means of the big auxiliary schooner, *CIUDAD DE CARTAGENA*, which he purchased recently for \$110,000, at Lake Charles, La. This vessel will make regular trips between Cartagena and the Crescent City, taking livestock and machinery to Colombia and bringing back products of that country to sell in the United States.

Capt. Hans Christopher Hansen, Portsmouth, Norway, has bought the auxiliary schooners *NOTTINGHAM* and *J. W. CLISE* at Mobile, Ala., and ordered construction at Tacoma, Wash., of another auxiliary of 2,500 tons. The three vessels are to be put in the gulf coast lumber trade. *NOTTINGHAM* is on Mississippi Sound, and *CLISE* is en route to Sydney, N. S. W.

Daily service by the steamer *DOLIVE* between New Orleans and Mobile is being arranged by agents of shippers and merchants of the two cities, led by Theodore Brent, general manager of the joint traffic bureau, of New Orleans. It is planned for the steamer to leave Mobile at 9 p. m., each day, arriving in New Orleans the following morning and leaving again for Mobile as soon as she can be loaded. *DOLIVE* belongs to the St. Tammany Development Co. It is also planned to start similar service on practically all the inland waterways between New Orleans and Houston, with a steamer of the same company

in service. The projects are the direct results of railroad rate adjustments which work against New Orleans, Mobile, Houston and gulf coast points. These lines will enable merchants of these cities to sell goods in territories which they cannot reach in any other way owing to recent rail freight rate increases.

* * *

The San Ramon Steamship Line, to operate between New Orleans and Colon, Panama, has been organized by the J. G. Rainwater Lumber Co. Service will be inaugurated with the sailing of the steamer SAN RAMON from the Crescent City to Orange, Texas, where she will load lumber for the Panama canal. The company has purchased SAN RAMON, and chartered five other steamers, which will be used, at first, in making deliveries of 8,500,000 feet of lumber for the Panama canal.

* * *

Shipments of corn, other food supplies and general merchandise from New Orleans to Tampico, Vera Cruz, Progreso and other Mexican ports have continued throughout the recent disturbances. Heavy orders were placed by Carranza government officials and Mexican importers with the exporters of New Orleans, and ships bringing sisal from Yucatan were sent back filled with food for the Mexicans. VIKING, of the Caribbean Steamship Co., on one trip carried a full load of corn. For more than a month there was a heavy demand for large schooners, small steamers, or any other craft which could be used as food carriers between New Orleans and Mexico, but few could be secured.

* * *

Evidently the days of the old river packet are not ended, for the Carter Packet Co. is just completing a large new steamer of this type, for use between Monroe, La., and New Orleans. She will be called CLIPPER, and is being built at the Slidell, La., ship yards. She is 150 feet long, 29 feet beam, 5 feet draft and has a carrying capacity of 1,000 bales of cotton. Her hull and all her woodwork are of Louisiana timber.

* * *

The Mexican Fruit & Steamship Co., formed in New Orleans with a capital of \$75,000, has purchased MARY G. DANTZLER, a 1,000-ton, four-master, and OSCAR G., a similar type. Auxiliary engines are being installed in both.

* * *

Fruit steamers from Central America report that they are held up by British and French cruisers in the Gulf of Mexico, and their nationality ascertained before they are allowed to proceed.

* * *

The Norwegian steamer SANGSTAD, which went ashore in the storm off Jupiter inlet, has been floated and has proceeded on her voyage from Baltimore to Honduran ports.

* * *

The American Fruit & Steamship Co., of New Orleans, M. Theodore Snyder, president, has bought the big auxiliary schooner, JUNE, in Portland, Ore., and as soon as she arrives from the west, the company will put her in service between gulf ports of the United States and Colon, Panama. JUNE is 170 feet long, 36 feet beam, and has depth of hold of 12.6 feet. She is equipped with a 100-horsepower engine and was built

by the St. Helens Ship Building Co., Portland. Her capacity is 650,000 feet of lumber. She is now under charter to W. R. Grace & Co., to carry lumber

from Portland to the Panama canal, whence she will bring mahogany logs to New Orleans, and thereafter make the Crescent City her home port.

In Philadelphia Harbor

By Joseph Fenerty

THE Chester Ship Building Co., Chester, Pa., has awarded a contract aggregating more than \$1,000,000 to the Westinghouse Machine Co., Pittsburgh, for turbines for 15 steamships now under construction or contracted for, at its ship yard. The first turbine was to be installed in the Norwegian steamer MALMANGER, the first vessel launched at the revived ship yard.

* * *

One of two lightships, constructed by the Pusey & Jones Co., Wilmington, Del., for the federal bureau of light houses, has been delivered to the government at Edgemoor. The new vessel, which is known as No. 101, is 110 feet long, 36 feet beam and is built entirely of steel. The light will be visible for 30 miles when the vessel is placed on her station off Cape Charles, Va. Fuel oil will be used for power. The vessel is equipped with the latest fog and submarine signals.

* * *

The William H. Cramp & Sons Ship & Engine Building Co., Philadelphia, has let contracts for the erection of four large shops. It has been known in financial circles for some time that the company's business exceeds that of last year and the awarding of the contracts is viewed as a preparation for large orders after the end of the war. The Belmont Iron Works received the contract for steel for the proposed structures.

* * *

DAVID BAIRD, schooner, built at Bath, Me., in 1882, and hailing from Philadelphia, has been purchased by a Lisbon, Portugal, firm, for \$32,000. BAIRD has been engaged in the coast and West India trade and will load a cargo for Portugal when the change in registry is completed.

* * *

Sugar shipments from the Hawaiian islands to Philadelphia, via the Panama canal, have been discontinued. Vessels heretofore engaged in carrying sugar from Honolulu and Kahului have found more profitable employment in the Atlantic trade. In the future, sugar will be brought east from the Pacific coast by rail.

* * *

Plans for extensive improvements to be made along the Delaware river front of Philadelphia have been completed. Bids have been received by the municipal department of wharves, docks and ferries.

* * *

PRINZ EITEL FRIEDRICH and KRONZ-PRINZ WILLIAM, German commerce raiders, formerly interned at the Norfolk navy yard, have been moved to the government yard at Philadelphia. Removal was made in order to permit needed improvements to be

made at the Norfolk yard. TALLAHASSEE, monitor, and submarines Nos. 23, 32, 36 and 37, have arrived at the Philadelphia yard for overhauling. They will be placed in commission when the work is completed.

* * *

A leaking valve in a ballast tank of the British steamer OCEANO, loading at Girard Point, Philadelphia, for Mediterranean ports, recently caused a loss of more than 10,000 bushels of grain before the valve could be repaired.

Boston Bay Doings

By Geo. S. Hudson

At the 163rd annual meeting of the Boston Marine Society, Capt. Peter H. Crowell was elected president. The society has 398 members. Last year \$15,435 was paid to dependents.

* * *

The Boston Molasses Co. is having a 60,000-gallon capacity barge for Porto Rico built by the Merrill-Stevens Co., Jacksonville, Fla.

* * *

A four-mast barkentine, building by Richard T. Green Co., Chelsea, Mass., has been sold to Norwegian interests.

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Two schooners, building at Fall River, Mass., for Rogers & Webb, Boston, four and three-mast, are named LUTHER LITTLE and FRANK MOREY, respectively.

* * *

The four-mast schooner JACOB M. HASKELL, Capt. Mercer, bound for the West Coast of Africa with a cargo including rum, flour and lumber, will receive \$110,000 outward freight and \$45 per 1,000 feet on mahogany for Boston. The proceeds of the voyage will aggregate about \$200,000, or twice as much as schooner cost 15 years ago.

* * *

The Russian sailing ship MARECHEN, Capt. Mansen, recently arrived at Boston from Caleta Buena with cargo of 3,600 tons of nitrate of soda.

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The two steam trawlers, COMBER and WHITE CAP, have been delivered by the Manitowoc Ship Building Co., Manitowoc, Wis., to the Bay State Fisheries Co., Boston.

* * *

The bay tug LEBARRON H. JENKINS has been sold to Capt. Joseph Ross, of Boston, and will be operated with the Ross fleet.

* * *

The tug NEPTUNE, Capt. Cunningham, towed Vincent Astor's hydro-aeroplane from New York to Marblehead, the flyer making the 300-mile trip in a specially designed covered lighter. The tow was so light that NEPTUNE was able to steam at almost top speed, making the passage in quick time.

Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

THE Universal Motor Co., Oshkosh, Wis., is building a marine motor which represents a high type of specialization. The company has concentrated its activities upon one size and model of motor, which was developed after more than 20 years of experience. Shop practice has been standardized and the methods of specialization so successfully employed in quantity production, have been adopted. Special machines and tools have been designed.

The motor is now being furnished for boating purposes, with or without full marine equipment; for electrical purposes in which it is connected to a 4-kilowatt, 60 or 110-volt generator for use for boat lighting, wireless or cooking; and for use with 3-inch bilge pumps capable of handling 265 gallons of water a minute.

In marine installations, the motor develops up to 12 horsepower and has a speed range of from 300 to 1,800 revolutions per minute. This size is said to cover about 80 per cent of the power boats in use, being applicable to boats up to 30 feet in length, and giving a speed up to 20 miles an hour, according to the size and weight of the boat. The motor is fully equipped, each part being interchangeable.

In the electric generator set, the motor is direct-connected. A special governor is provided to insure a smooth current. This installation has been successfully adapted to larger motor yachts, where it is used for furnishing current for lighting, cooking, wireless and for flashlight purposes. The set is being used in a number of installations for the United States and foreign governments.

In the pumping outfit, the motor is directly connected with a 3-inch discharge, 4-inch suction pump. It is connected to the engine flywheel by an arm coupling. The whole outfit is rigidly mounted on a substantial sub-base. The engine can be readily disconnected and used for other purposes.

A New Shop

The Hyde Windlass Co., Bath, Me., has let a contract for the erection of an 80 x 150-foot extension to its machine shop. This department at present is 80 x 400 feet and is provided with a 20 x 200-foot gallery. This gallery will be extended through the remainder of the present building and throughout the ex-

tension. In addition, a second gallery, also 20 feet wide, will be built in the extension. The company has placed orders for approximately \$100,000 worth of new machine tools for installation in the extension. The company also will erect a new 2-story and basement, 45 x 60-foot office building, since the old structure is to be removed to provide room for the machine shop extension. It is expected that the extension will be completed shortly after Jan. 1.

Navigating Instruments

If a steamship is to be navigated successfully under modern conditions, it is essential that a complete set of nautical instruments be provided. In this connection questions often arise as to what instruments are necessary under given conditions. The following list of instruments recommended for a modern freight-carrying steamer of 10,000 tons capacity or less has been compiled by Dobbie McInnes, Limited, manufacturer of nautical instruments, Glasgow, Scotland:

One standard compass with azimuth mirror and 10-inch card, properly installed in a modern binnacle.

One liquid wheelhouse steering compass equipped with a suitable binnacle. This compass should be so arranged that it will practically coincide in deviation with the standard compass.

One 10-inch spirit compass mounted aft on a pillar stand.

One spare card for standard compass.

One sounding machine.

Four liquid compasses in boxes for life boats.

One timepiece for saloon.

One timepiece for wheelhouse.

One timepiece for charthouse.

One aneroid barometer.

One navy pattern telescope.

One pair of binoculars.

One taffrail log and line, complete.

Two megaphones.

One hydrometer.

One log slate.

Two log glasses.

Two thermometers.

Bearing Metals

The Cleveland Alloys Co., Cleveland, has issued an interesting booklet describing its line of bearing metals. The metals are manufactured in six different grades, each of which has been subjected to a complete physical test. They are furnished in cakes which are made round in order to fit the ladle. These grades are respectively adapted for use on reciprocating engines, motor bearings and machines subjected to shocks in which the pressures exceed 100 pounds per square inch of projected area; to

work not subjected to severe shocks or pounding; for high speeds and from light to moderately heavy loads; for speeds and loads up to 75 pounds per square inch; for ordinary work for loads not exceeding 75 pounds per square inch; and for line shafting and light duty machines.

Stevenson Taylor

Having disposed of his interest in the Quintard Iron Works Co., New York, Stevenson Taylor has resigned as a director of that company and also as a director of the Alberger Pump & Condenser Co. This action on the part of Mr. Taylor will enable him to give his undivided time to the interests of the American Bureau of Shipping (American Lloyds), of which organization he was elected president early in March, 1916, and which carries with it the management of this important institution so closely connected with American ship building and underwriting.

Hosmer Resigns

H. D. Hosmer, general passenger agent of the Great Lakes Transit Corporation, Marine National Bank building, Buffalo, resigned on Dec. 1 to devote his time to other business. Pending the appointment of a general passenger agent, all communications pertaining to passenger matters should be addressed to J. E. Deasy, assistant to the president.

Owing to the increase in business, the offices of the American Screw Propeller Co. have been removed from 1520 Sansom street to more commodious quarters in the Hale building, Juniper and Chestnut streets, Philadelphia. The company is a designer of screw propellers by the Dyson method.

The Nordberg Mfg. Co., Milwaukee, Wis., announces the appointment of H. W. Dow as sales manager. Mr. Dow has been associated with the Nordberg Mfg. Co. in the engineering and sales departments for 12 years. The Nordberg Mfg. Co. builds steam and electric hoists, corliss engines, poppet valve engines, uniflow engines, air compressors, oil engines and Nordberg-Carels diesel engines.